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PRELIMINARY DISCRIMINATION TRAINING IN THE TEACHING OF FRENCH PRONUNCIATION.

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A NEED TO DETERMINE THE VALUE OF PRELIMINARY DISCRIMINATION TRAINING IN INCREASING THE EFFECTIVENESS OF LANGUAGE LABORATORY PRACTICE ON THE PRONUNCIATION OF FRENCH SOUNDS HAS RESULTED IN THIS STUDY. DESCRIBED IN CHAPTER 2 ARE ELEVEN PILOT STUDIES, INVOLVING MORE THAN 1,000 STUDENTS, THAT PERMITTED THE DEVELOPMENT OF MATERIALS, TRAINING PROCEDURES, AND METHODS OF EVALUATION NEEDED FOR THE MAJOR EXPERIMENTATION. FOLLOWING A DISCUSSION OF THE PROBLEMS OF DEFINING AND TESTING DISCRIMINATION, TRAINING DISCRIMINATION, EVOKING STUDENT ORAL RESPONSES, AND JUDGING PRONUNCIATION, THE REPORT EXPLAINS THE THREE CONTROLLED MAJOR EXPERIMENTS CARRIED OUT TO TEST THE MAJOR HYPOTHESIS OF THE PROJECT. FOR EACH, THERE IS A CLARIFICATION OF THE EXPERIMENT'S HYPOTHESIS, SUBJECTS, DESIGN, LANGUAGE LABORATORY FACILITIES, PROCEDURES AND MATERIALS, SCORING, DISCRIMINATION TEST, AND RESULTS. CITED IN THE ANALYSIS OF THE EXPERIMENTAL FINDINGS ARE THE CONCLUSIONS THAT DISCRIMINATION TRAINING DID RENDER MEASURABLY MORE EFFECTIVE SUBSEQUENT LANGUAGE LABORATORY PRACTICE IN THE CASE OF THE PHONEMIC PROBLEM OF DISTINGUISHING AMONG THE FRENCH SOUNDS "EN" . . . "ON" . . . "AIM," BUT NO SUCH MARKED IMPROVEMENT WAS NOTED IN THE CASE OF THE PHONETIC PROBLEM PRESENT IN THE FRENCH "CHAUD" VERSUS THE AMERICAN "SHOW." LISTED AMONG THE CONCLUDING REMARKS ARE A NUMBER OF IMPLICATIONS SUGGESTED BY THE EXPERIMENTATION AND A BIBLIOGRAPHY OF REFERENCES. THREE APPENDIXES INCLUDE MATERIALS USED IN THE THREE EXPERIMENTS AND AN ARTICLE BY PIMSLEUR ON PROGRAMING ACOUSTIC DISCRIMINATORY SKILLS. (AB)

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preliminary discrimination training in the teaching of french pronunciation

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PRELIMINARY DISCRIMINATION TRAINING IN THE TEACHING OF FRENCH PRONUNCIATION

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CONTENTS

FOREWORD i

CHAPTER 1

INTRODUCTION AND REVIEW OF THE LITERATURE 1

CHAPTER 2

PILOT STUDIES 3

CHAPTER 3

DISCUSSION OF SALIENT PROBLEMS 12

a. Defining and Testing Discrimination
b. Training Discrimination
c. Evoking Student Oral Responses
d. Judging Pronunciation

CHAPTER 4

FINAL EXPERIMENTS 18

CHAPTER 5

CONCLUSIONS AND DISCUSSION 25

REFERENCES 27

APPENDIX A: Materials Used in Final Experiment I 29

APPENDIX B: Materials Used in Final Experiments IIA and IIB 43

APPENDIX C: "Programming Acoustic Discriminatory Skills," by Paul Pimsleur. 57

FOREWORD

The research studies reported herein could not have been undertaken without the enthusiastic cooperation of a host of school administrators and teachers in many schools. The authors wish to express particular appreciation to the superintendents, principals and teachers of the schools where the experiments were carried out. The cooperating school districts and administrative staff were:

South Bay Unified High School District: W. Earl Brown, District Superintendent; Oscar Davison, Assistant Superintendent; H. C. Uhls, Principal, Aviation High School; Lloyd Waller, Principal, Mira Costa High School.

Compton Unified High School District: Franklin Hemphill, District Superintendent; Mrs. Doris Westcott, Principal, Compton Senior High School; Mrs. Martha Borders, Assistant Principal, Compton Senior High School.

Culver City Unified School District: Jack Singer, District Superintendent; Vincent Alexander, Deputy Superintendent of Educational Services; A. Paul Adamson, Principal, Culver City High School; Drayton E. Marsh, Principal, Culver City Junior High School.

Los Angeles Unified School District: Ellis A. Jarvis, Superintendent; Herbert F. Popenoe, Director, Administrative Services Branch; William J. Ferguson, Principal, Paul Revere Junior High School.

Centinela Valley Unified High School District: Jefferson L. Garner, District Superintendent; Lowell K. Brubaker, Principal, Lennox High School; Howard N. Waymire, Principal, Leuzinger High School.

Santa Monica Unified School District: Glen T. Goodwill, District Superintendent; Fred A. Zannon, Assistant Superintendent; Julius H. Stier, Director of Research; George K. Drake, Principal, Santa Monica High School; Carleton Shay, Test Counselor, Santa Monica High School; Wade F. Thomas, President, Santa Monica City College.

The interest displayed in this project by these persons is testimony to the fact that our public schools are indeed alert to the need for educational research which might lead to the improvement of instruction.

It may be of interest to those embarking upon inter-disciplinary research to read of some of the advantages and drawbacks as they affected this project. Two of the investigators, Dr. Pimsleur and Mr. Alter, were specialists in French and foreign language instruction with training in psychology. The other two, Dr. Keislar and Mr. Mace, were trained in educational psychology with some knowledge of the French language.

The advantages of this collaboration were evident throughout the experiment. Questions concerning the French language and problems of language teaching were viewed, for example, both in terms of linguistics and the learning process.

While this dual approach clarified and gave perspective to issues central to the study, it was impossible to reach a completely consistent framework which would satisfy the requirements of both fields. The psychologists continually introduced theoretical issues and principles of learning which encouraged the French teachers to be more precise in statements describing procedures. But, such theoretical concerns frequently seemed to the French teachers to be rather remote from the concerns of the classroom. Although the frequent discussions of issues were valuable to the entire staff, the divergence of the points of view resulted in sessions that were at times overly lengthy. A cardinal virtue required in this inter-disciplinary research was found to be patience. It was rewarded by increased acquaintance with another field and new insights into one's own.

CHAPTER I

INTRODUCTION AND REVIEW OF LITERATURE

The Language Laboratory, still a bone of contention a few years ago, is now widely accepted; labs have been installed in most colleges and many high schools. The problem now is not whether the lab does any good or not for it is with us to stay. The issue is how best to use it.

The problem is enough to challenge linguists and pedagogues, for we are far from having a definitive answer. Certainly the lab must play a role in teaching pronunciation, in teaching syntax, in teaching comprehension. Among these, pronunciation has provided the most frequently heard arguments in favor of the lab. It is said that the lab helps substantially to improve student pronunciation, but it is not clear just how this takes place. The popular argument is that the student will acquire native-like speech by being able to compare his pronunciation with that of a native speaker. Many teachers have already realized that this hope is far too optimistic. It is evident that students are rather poor judges of their pronunciation for a number of reasons. Not seeing the relevance of foreign language study in their lives, they may simply not care whether they acquire good pronunciation. They may be discouraged from making "funny foreign noises" by fear of ridicule from their peers, or by fear of identifying with socially disapproved minority groups (e.g., Puerto Ricans in New York, French in Montreal, etc.). But, apart from lack of motivation, the most important reason why the lab cannot foster good pronunciation by itself is the fact that that people tend to be lenient with themselves; they tend to think their pronunciation is "good enough" when actually it is not yet acceptable. The students, not having been trained to be judges of their pronunciation, perform this task inadequately. They are unable to note which features are relevant and which are not. It may be desirable to train beginning students to be better judges of pronunciation in the foreign language before being required to judge their own pronunciation. If such training could be accomplished efficiently, it might enable the student to profit more from subsequent lab practice. The language laboratory offers individual instruction to each student; continuous monitoring by the teacher is impracticable due to the number of students in most classes. Hence, the student must be able to monitor himself, and to provide a competent judgment as to the correctness of his own pronunciation efforts. The latter consideration is, in fact, the "teaching machine" concept, that is, the student is supposed to be made capable by the preliminary training of learning good pronunciation without the assistance of a teacher. Since the pronunciation of many teachers leaves something to be desired, the student's pronunciation may become better than his teacher's, upon whom he does not rely as a model. If the language laboratory is to realize its potentialities as a teaching machine, the teacher must not be necessary as the corrector and arbiter of good pronunciation. The student must be trained to perform this function for himself, in *tête-à-tête* with the machine.

The major hypothesis of this project follows from the foregoing considerations: *Students who have been trained to judge good from poor pronunciation before practicing in the language laboratory will acquire better pronunciation than students who have not received such training.*

The testing of this hypothesis in a controlled experimental fashion is the object of this research project. It is by no means a simple matter, since many terms require specification: One must specify the characteristics of students in terms of intelligence, sex, stage of learning. The training the experimental group is to receive must be precisely specified both in terms of content, method of presentation, and length. It is also necessary to clarify what training is to be given to the control group while the experimental group is receiving instruction in judging pronunciation. Other questions deal with the kind of language laboratory practice the students are to receive, and how their final pronunciation in the foreign language is to be evaluated. Most central of all is the problem of what is meant by judging "right from wrong" or "good from poor" pronunciation. This sort of task goes by the name of "discrimination," yet it is not at all clear what the term means when referring to foreign language pronunciation. Does it mean merely being able to tell if two

utterances are the same or different? Does it mean attaching the correct meaning to each of the two? Does it mean identifying one speaker as a Parisian and another as a Lyonnais? A clarification of the term discrimination, as well as other problems of interest to language teachers which arose in connection with this research, will be discussed in the course of this report, particularly in Chapter 3 and in the Conclusions.

Review of the Literature

The major problem of this investigation was that of evaluating the effect of preliminary discrimination training upon a subsequent task, in this case the acquisition of pronunciation responses. The literature of psychology contains a number of relevant references. Some deal with the effects of discrimination training on the learning of motor tasks. For example, Goss and Greenfield (1958) trained subjects by having them give different responses (largely verbal) to four light intensities; on the subsequent transfer-motor task of pushing a lever in one of four directions, subjects with preliminary discrimination training were clearly superior. Other research shows the importance of attaching labels to stimulus categories. Norcross and Spiker (1957) had children respond by giving labels to pictures; this training facilitated the subsequent learning of new motor responses to these stimuli. Reese (1960) demonstrated that the more distinctive the labels are, the more they facilitate a later motor task. Albert (1959) experimented with the discrimination of cylinders of various sizes, and concluded that verbal labels served as cue-producing stimuli.

The importance of labeling or categorizing in verbal behavior has been the subject of considerable experimentation, (e.g., Brown, 1958). Most of it has dealt with words or other meaningful units, while our present concern is with sounds or phonemes. Perhaps most germane are the experiments of Liberman, Harris, Hoffman and Griffith (1957) and Griffith (1957), dealing with the discrimination of speech sounds within and across phoneme boundaries. The relation between labeling and discrimination is central to our experiments, as are such other questions as the relation between listening and speaking, the relation between the learning of responses and discrimination among stimuli. They are discussed, and the relevant literature considered, in Chapter 3 and in the conclusions.

Concerning the use of auditory discrimination in language teaching, the most relevant work has been that of Morton (1960), and Lane (1961A), working in Spanish.

A number of works give suggestions on the use of the language laboratory, among them Brooks (1960), Kone (1960), Oinas (1960), Marty (1960), and Stack (1960). Brooks (1960) suggests that the students should be able to listen to the sounds many times, repeat them, and if possible play them back for comparison with the model. Some disagreement is found with the playback condition on the part of Mathieu (1960), Roertgen (1959), Lorge (1960), and Marty (1960, pp. 70-71). For the purposes of the experiments reported herein, language laboratories having delayed playback facilities were used.

CHAPTER 2

PILOT STUDIES

To develop the materials, training procedures, and methods of evaluation needed for the final experiments, a strategy of frequent pilot studies was adopted. In all, eleven Pilot Studies were carried out prior to the three final major experiments. While costly in time, effort, and expense, this procedure was felt to be superior to undertaking one crucial complex experiment, however well planned. The many aspects of the major experimental question, such as the writing of training programs, and the construction of valid and reliable tests, required empirical try-out as a basis for development and refinement. This chapter will be devoted to a condensed chronological account of the eleven pilot studies which may be useful to others as an example of experimental strategy.

Pilot Study 1

The purpose of this study was to determine the strengths and weaknesses of a newly developed discrimination program and an accompanying test of discrimination ability. It became apparent early in the work that the post-test of discrimination ability should be constructed first, and a training program then be designed to teach all students to achieve near-perfect scores in the test; i.e., teach them to discriminate very well.

Discrimination Test. Four words were selected to illustrate a French phoneme judged to be difficult for Americans to pronounce; namely, *u* as in (French) *flute.*[1] Four words containing this sound were chosen, two in open and two in closed syllables: *but, vue, flute,* and *tube.* The voices of some thirty students were recorded pronouncing these words; they varied from near-native to very poor pronunciation. Four native speakers similar in age and voice quality to the Americans recorded what were considered model pronunciations. By selective recording, sixteen pairs of words were put on tape, each pair containing first a native and then a student voice. An equal number of male and female pairs were used; the voices were presented in random order. Half the student pronunciations were judged "acceptable" by several French teachers; the other half were judged "unacceptable." In taking the test, subjects listened to a pair and immediately circled the word "acceptable" or "unacceptable" for the student pronunciation.

Training Program. A program was prepared to train subjects to discriminate between "acceptable" and "unacceptable" pronunciations. Four sets of ten items were prepared which resembled those on the test. They began with very easy discriminations of obviously unacceptable pronunciations and moved to finer discriminations. During the training, the taped voice of the instructor pointed out the salient features of the poor pronunciations from time to time.

Subjects. Three classes of tenth grade and three of seventh grade students were used for this experiment. The total number was approximately 160.

Procedure. Within each grade level, the following procedure was adopted: One class was given the test twice with no training to determine the amount of learning due to pre-testing. A second class was given the pre-test, then training, then the post-test. A third class was given only training and the post-test, to control for possible effects of the pre-test upon the post-test.

Results. No significant differences were found between any groups on any test. In fact the post-test scores were lower than the pre-test scores for all groups, though not significantly so. These findings revealed

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[1]For ease of reading, normal French orthography (e.g., *flute, pain)* will most often be used in the report; it will usually be clear from the context whether a sound or a written word is meant. In cases where ambiguity may arise, phonetic or phonemic notation will be used, as appropriate, e.g., [pɛ̃] or /pɛ̃/.

several important points. (1) The training program had raised the subjects' standards too high, so that they were now prone to judge as "unacceptable" pronunciations which the judges had felt to be "acceptable." (2) The naive subjects could discriminate quite well before receiving any training. (3) We were training them to accept our "standards of acceptability," when the judges themselves could not agree on what was "acceptable." (4) There appeared to be too much guessing on subjects' part; they seemed to have received too little prompting during the training. (5) A few subjects in the control group had taken French for two years, but got scores no higher than naive subjects; this finding suggested a lack of validity in the test.

The procedure of requiring students to decide whether a pronunciation was acceptable or unacceptable was abandoned at this point. Instead the plan was adopted of having the student respond to each item in a fashion that lent itself to objective scoring.

Pilot Study 2

Instead of attempting to teach and measure students' ability to judge acceptable or non-acceptable French pronunciation in this experiment, the student was taught and then tested on his ability to discriminate between two monosyllabic French words. This difference was a very clear one to native speakers, but it was felt to be a difficult one for American students. The purpose of this study was to try out a program designed to train and test discrimination of minimal pairs. A further purpose of the study was to discover whether discrimination was facilitated by having students speak the French word out loud.

Training. Four problems were selected which involved phonemic distinctions not present in English. Each problem was represented by a minimal pair: *banc ... bain, but ... boue, peau ... pont,* and *vie ... vue.* During training subjects were taught to discriminate between the two words in each pair. Fifteen items were used to train each pair; for each item, the student saw in his booklet the two written English equivalents of the two French words. He heard one of the French words and was required to circle the appropriate written English word. Before having to circle, he had received considerable instruction and illustration of the discrimination involved. The point of using English equivalents (*bench* for *banc, goal* for *but,* etc.) was to avoid letting the subjects see the French word written. It was felt that the introduction of French orthography might lead to interference when subjects later were required to pronounce the French words.

Test. The test of discrimination consisted of three sets of eight items. The first set consisted of a single French word, the second of short phrases containing one of the French words, and the third of short sentences containing one of the French words. For each item, the student responded by writing down the English equivalent of the French word he thought he heard. To reduce the task of recalling, the eight French words were printed on top of the page.

Subjects. The subjects were three classes of seventh-grade social studies students, totaling approximately one hundred persons.

Procedure. One class received no discrimination training; they were merely asked to pronounce the French words aloud in chorus several times after hearing the French words and the English equivalents from a tape. The second group received the discrimination training already described; they were not required to pronounce the words at all. The third group received the training program, and was also required to pronounce the words aloud. All three classes were given the discrimination post-test.

Results. The post-test was scored as three sub-tests of eight items each. No significant differences were found.

The use of English equivalents was found to be a confounding factor, for students might have learned to discriminate the French words, and yet do poorly because they could not remember the English meanings

required as responses on the test. Therefore, in the next pilot study, a special post-test was devised so as to permit a separate assessment of the students' ability to discriminate without having to recall the English equivalent.

Pilot Study 3

The point of this study was to improve the discrimination test by trying three different types of measures. The training programs were those used in Pilot Study 2.

Test. The first of the three tests, Subtest I, used in this study was similar to that used in Pilot Study 2: eight English words were printed at the top of the page; the subjects heard a French word and were to write down its English equivalent.

The second test, Subtest II, did not involve a knowledge of English equivalents. It contained forty-eight items; in each item, the subjects heard a pair of words, phrases, or sentences (sixteen of each). For half the items, the members of the pair were identical; for the other half, the two members differed in one of the phonemic distinctions under investigation. For each pair, the subject was required to circle either the word "same" or the word "different" in his answer booklet. This procedure met a major criticism of the preceeding study.

The third test, Subtest III, also involved forty-eight items. Here, the subjects heard a single French word, phrase, or sentence (sixteen of each) containing one of the phonemes under study. On the answer sheet were printed the English equivalents of both the word that was said and its minimal-pair partner. Subjects were to choose between the two words. This third method was designed to reduce the burden of memory by giving the two English words, while making the discrimination more difficult by presenting the pronunciation of one of the French words rather than both.

Subjects. Subjects were approximately 100 tenth-grade students in three social studies classes.

Procedure. No pre-test was given. All three parts of the test were given as a post-test. One of the classes, which constituted Group 1, was given only pronunciation practice. They pronounced in chorus the eight French words and were also informed of their English equivalents. They were given no discrimination training. Group 2 was given the same discrimination training as the corresponding group in Experiment 2. Group 3 was given this discrimination training program as well as the pronunciation practice given Group 1 in this experiment.

Results. Although the means for the three groups indicated that discrimination training resulted in higher scores on the discrimination test than pronunciation practice, the differences were not large enough to be significant. Since individual differences in discrimination ability prior to the experiment were left uncontrolled, a large error variance was present in the analysis. This would act to mitigate against significant findings. To control for this effect, it would be necessary to use a pre-test of simple discrimination ability without knowledge of the English equivalent. This feature was planned for Pilot Study 4.

Pilot Study 4

In Pilot Study 3, no opportunity was given to assess the effects of the training procedures upon the subject's actual pronunciation of French words. This was accomplished in Pilot Study 4 without the use of language laboratory facilities by using three classes which met for two periods each. During the first period, data on discrimination were obtained. During the second, students were called into another room individually to record their pronunciations of French words as they heard the French words from a tape recorder. In Pilot Study 4, Subtest II, of the discrimination test referred to in Pilot Study 3, was used as the pre-test. This was done to permit the use of a co-variance analysis to lend greater precision to the study.

Procedure. All groups were given the same pre-test just referred to. Group 1 was given pronunciation practice; Group 2, discrimination training; and Group 3, both pronunciation and discrimination training. The discrimination post-test consisted of the first two sections only of the test used for Pilot Study 3. All subjects were then called in individually and recorded their pronunciations of the French words in response to the French word presented from a tape recorder.

Results. Scores on the discrimination post-test revealed no differences among the adjusted means of the three groups. A correlation of .62 was found between the pre-test and the post-test score for the discrimination test. It was inferred that the re-test reliability of this test must be somewhat higher than this figure. Since the test took only 10 to 12 minutes, its reliability was deemed quite adequate. However, the lack of any significant treatment effects clearly indicated that the training programs in discrimination were ineffective. This reasoning led to a completely different line of attack for Pilot Study 5.

Discussion

Procedural Changes. One weakness of the previous studies is that the student learned only a few pairs of words. Training and testing were devoted to the discrimination between these few French words. It was felt that the student would not generalize to new words, which, in a sense, is a primary objective of actual instruction. A second weakness is that the stimulus cue for the pronunciation of the French word requires the teaching of foreign language vocabulary.

In the approach used in Pilot Study 5, students were taught a certain amount of French orthography so as to be able to use real French words. All the students were taught one rule, namely "final consonants are not pronounced." They also learned the pronunciation of certain letters and letter combinations (e.g., *au ... u ... en ... ou*). This permitted the use of a wide variety of French words, completely new words to which the student must generalize his pronunciation ability. The disadvantage of this procedure, naturally, lies in the possible interference of his English speaking habits of pronouncing printed combinations of words; therefore, considerable training was planned. But, this procedure has two major advantages. First, one can use real French words, new ones as well as old, to occasion the French pronunciation. It becomes unnecessary to have the student learn the English equivalents. Secondly, the results of the experiments, if positive, will have far greater generality for practical French teaching.

Choice of Problems. It was tentatively planned at this point that the final experiment would treat three different kinds of pronunciation problems.

The first kind, represented by the French sounds *on ... en ... in* and *eu ... u ... ou,* involves teaching the students to make phonemic distinctions which are new to him. He hears only natives say these phonemes, and is not trained to tell good from bad pronunciations of them. The question is whether it is sufficient to train discrimination on the phonemic level for the student then to find an acceptable pronunciation of the phonemes himself.

In a second type of problem, the subjects are trained to discriminate between the un-diphthongized French *o* and the diphthongized American o^{u}. This is a purely phonetic problem of teaching students to judge "good" and "bad" pronunciation of this sound. On the articulatory level, relatively fine adjustments are required for an American to pronounce *chaud* or *vaut* in a French rather than an American fashion.

A third kind of problem, that of the French *r,* is one of the most perplexing for French teachers. It calls for adoption of a completely new articulatory position, an endeavor in which some students never succeed. Due to the amount of time needed to perfect the training and testing procedures for the final experiment, it was only found possible to deal with the first two sorts of pronunciation problems. However, the French *r,* a fascinating pedagogic problem in itself, can presumably be trained in ways similar to those developed for

the other pronunciation problems. It is possible that *r* may lend itself especially well to training in some sort of automated, teacherless fashion, for the adopting of the new articulatory position involves a good deal of trial and error on the part of the student, which he may be more inclined to do in the privacy of his contact with the training tape than when facing the teacher.

Pilot Study 5

The purpose of this study was to evaluate the efficacy of a program for training discrimination among the nasal phonemes *on ... en ... ain.*[1]

Training Program. In the first section, subjects had before them a list of pairs of French words containing the sounds *on* and *en,* e.g., *dont ... dent.* They first heard a native speaker pronounce all the words in pairs, to make explicit the contrast. Then the native speaker pronounced only one word of each pair and subjects were to make a mental choice as to which word it was before hearing the correct answer given. On a third run-through of the section, one word of each pair was again pronounced, but this time subjects had to circle their choice as to which it was; they were again given the correct answer, but with instructions not to change their answer if it was incorrect. A measure was thus obtained of the effectiveness of the training while it was in progress.

A second section trained discrimination between *en* and *ain* in similar fashion. A third section trained the three-way discrimination, *on ... en ... ain.* For example, when the speaker pronounced *sent,* subjects were to circle one of the three words: *sont ... sain ... sent.*

Subjects. Thirty eleventh-grade students served as subjects.

Results. The data indicated the program was basically effective. However, there was still much variability among the scores, though the aim was to train all subjects up to a high level of discrimination ability. An item analysis revealed some items had been missed by many subjects and were therefore probably unclear or too difficult. Poor performance was noted on the first section as compared with the other two, suggesting that the *en ... on* distinction was especially difficult. These findings led to revision of the program for use in Pilot Study 6.

Pilot Study 6

The purpose in this study was to try out a revised nasal vowel training program which included both changes in the old program and new additional sections for training orthography and for discrimination in a context.

Training Program. The order of the first two sections of the previous program was reversed so as to present the *en ... ain* distinction before the *en ... on* one. Items which had been consistent ly missed were re-recorded more clearly.

New sections were added to the program for training orthography, on the grounds that the French sound-symbol associations needed to be very thoroughly learned by the subjects before the final pronunciation test, in order to avoid this possible confounding factor. In the first part of the orthography program, subjects saw three words printed in their booklet and heard three words pronounced. One of the three words they heard was not the same as the printed word. Subjects were asked to underline the "error" and to write in above it the "correct" word, that is, the one they had actually heard. For example, the subject saw */end ... sain ... vont,* heard */ont ... sain ... vont,* and was expected to write */ont* above */end.* There were ten such items. A second section was similar, using ten four-word items.

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[1]The spelling *ain* was used instead of *in* because it occurs in more unchecked monosyllabic words.

New program sections were added to train discrimination in context, on the grounds that this is a higher level of discrimination and that the results of the final experiment were more likely to be favorable to the hypothesis if subjects had been thoroughly trained in discrimination. The first of the new sections used words on which the subjects had already been trained, but the words were presented this time in short sentences. For example, subjects heard *Ils y vont* and were asked to circle one of the choices: *vend ... vont ... vain.* The next section presented the same kind of problem, but in more difficult form because the sentences were longer and the key word was often in an unaccented syllable (e.g., *Ils vont faire cela*). As in the other sections, subjects received immediate knowledge of the correct response and then heard the item repeated.

Subjects. The subjects were 30 twelfth-grade high school students.

Results. The revision of the first part of the program produced improved performance. Using the test in Section 3 as a measure (see Pilot Study 5 above) the mean for twenty-two subjects on ten items was 6.7, with little variability (s.d. = 0.9); a chance score would be 3.3. The training had been effective, but an item analysis again indicated weaknesses requiring further revision. Performance on the first section was still poor in comparison with the other two sections, indicating the possibility of a warm-up effect.

Performance on the orthography and context sections was not satisfactory; the students learned to perform the discrimination task, but there was too much variability, indicating that some had learned very little. Revision of these sections was indicated, possibly in the direction of providing additional sections to smooth the transition from the simple tasks of Sections 1, 2, and 3, to the more difficult ones of the later sections.

Pilot Study 7

The purpose of this study was to try out a program for training the phonetic discrimination between the undiphthongized French *o* and the diphthongized American o^u.

Training. Extended instruction and examples were provided in which a qualified phonetician gave both correct and incorrect (diphthongized) pronunciations of words like *chaud* and *saut.* The subjects saw a list of words in their booklet. After they had heard each pronounced both correctly and incorrectly and had been drilled on the distinction, they were asked in the next part of the program to indicate (by circling *F* or *A*) whether a given pronunciation of each word was French or American. This test was given prior to the training as a pre-test and again as a post-test following the training.

Subjects. The subjects were 31 eleventh-grade students.

Results. Prior to training, the median score for the 30-item test was 22.8, with scores ranging from 11 to 29. Following training, the median score was 29.5. Sixteen people achieved perfect scores, eight missed only one item, and no score was below 19. Clearly, the subjects could discriminate somewhat better than chance before the training, but were led by the training to the point of making almost perfect discriminations.

Pilot Study 8

The purpose in this study was to try out the materials described in Pilot Studies 6 and 7 on more mature, junior college subjects.

Results. When administered to two introductory psychology classes with the procedures already described, the programs yielded results similar to those obtained at the high school level. The nasal vowel program (*en ... on ... ain)* seemed to be accomplishing its purpose, though the efficacy of the orthography and context parts was still in doubt. As for the program dealing with the French *o* versus the American o^u, it was concluded from the almost perfect scores and from student reactions that the training was overly long; good

results could probably be obtained with a much shorter program. It was also decided that, now that it had been proven effective, the program could be re-recorded using a variety of French and American voices in place of the voice of one phonetician; this would teach the subjects to discriminate a good from a bad o regardless of the sex or voice quality of the speaker. In the construction of the re-recorded program, authenticity and naturalness of pronunciation was assured by asking native French speakers to pronounce the French words *chaud ... saut ... beau ... faux,* while American speakers were asked to pronounce the corresponding English words *show ... sew ... bow* (-tie) ... *foe.*

Pilot Study 9

The purpose of this study was to try out the newly revised nasal vowel *(en ... on ... ain)* training program.

Training Program. A number of revisions had been made in the nasal vowel program. (1) The first section was lengthened to compensate for the possible warm-up effect noted in Pilot Studies 5 and 6. (2) In order to control for the possible effect of training with respect to orthography, a special training program was prepared to teach the spelling of French words used in the study. It was planned that this program might be included for both experimental and control groups in the final experiment. In this way, differences in pronunciation between experimental and control groups in the final experiment could not be ascribed to differences in ability to spell the words to be pronounced. (3) The final section, consisting of fairly long sentences, was deemed too difficult; it was re-recorded with the sentences spoken more slowly and repeated twice.

Subjects. The subjects were students from 3 eleventh-grade history classes.

Results. Subjects did better on the discrimination tests than previously, but did not attain the near-perfection that had been hoped for. A mean score had been attained in Pilot Study 6 of 6.7 out of ten items; this was raised to 8.2 in this study, with similar variability.

The new spelling training was found to take too much time for the benefit derived from it. In addition to this, it was decided that the task of discriminating between French sounds should require the student to respond differently to each of the sounds by identifying the appropriate written form. In the light of this view of discrimination, the spelling program would in effect teach both the experimental and control groups to "discriminate." For this reason, a preliminary spelling program was abandoned. In its place was developed a plan to provide "exposure" to French spelling in the final experiment for both groups; the control group, however, would not receive training in identifying which spelling corresponded to each sound.

Pilot Study 10

The running of a group experiment in a language laboratory, with subjects who are not familiar with the equipment, is fraught with pitfalls of a technical sort which, trivial as they seem, can ruin the best laid experimental plans. In order to gain experience in running such an experiment, to try out the newly revised *o ... o*^{u} program, and to compare two types of control groups, a brief pilot study was planned. This was the first pilot study to run through the whole design of the final experiment: discrimination training, laboratory practice, pronunciation post-test.

Subjects. The subjects were two classes of eleventh-grade history students.

Procedure. The first class was divided randomly into two groups: the experimental group listened to the *o ... o*^{u} training program through earphones; the control group listened passively to the lab practice materials, but did not get specific training in discrimination.

Next, both groups actively went about a lab practice session: they first recorded 15 one-word items, imitating a native speaker, and then listened back to this recording; then they recorded 8 two-word items, imitating the native, and listened back.

Following the laboratory practice, both groups took a pronunciation test. They read from the booklet the same words they had heard during the training and practice sessions, and recorded them on their tape. The pronunciation test had several sections, consisting of single-word items, two-word items, and three-word items. The principle behind the use of two-word and three-word items was that these tasks, being more difficult than the pronouncing of a single word, might show up differences in pronunciation ability more clearly. The tests were scored independently by two judges, using a five-point scale to rate "quality of pronunciation" for each section of the test. A subject's score was the total points received from both judges on all four parts of the test (thirty points maximum).

The second class participating in this pilot study was also divided into two groups, an experimental and a control. The only difference between this class and the first was that in this case, the control group did nothing during the time the experimental group was receiving discrimination training.

Results. As part of the training, the two experimental groups received a discrimination post-test. The median of the combined groups was 14.5 out of 16 items, with little variability. This indicates that the experimental groups had learned to discriminate well between American and French pronunciations of words containing the sound *o*.

In the first class, the experimental and control did not differ significantly on the pronunciation post-test, but the means were in the expected direction (25.2 and 21.3, respectively). In the second class, the experimental and control groups did not differ significantly, and the means were not in the expected direction (18.5 and 23.3, respectively). It was obvious from these findings that if the training program was having any beneficial effect, it was too slight, or our test was not powerful enough to detect it. A larger number of subjects and improved experimental procedure might make a difference. The adverse finding in the second class was attributed to the fact that the control group, while sitting quietly, could hear the training coming from adjacent earphones and therefore might have been almost as well trained as the experimental group.

Pilot Study 11

An interesting hypothesis had been discussed during the course of the year's work. It was felt that discrimination training might be more effective in causing improved pronunciation if the subjects spoke aloud during the training, thereby presumably adding proprioceptive cues to the purely auditory ones. Pilot Study 11 was designed to test this "mediation" hypothesis (Lane, 1961C), as well as to provide a run-through of the nasal vowel program before the final experiment.

Subjects. The subjects were from two first-period, eleventh-grade history classes, totaling fifty students.

Procedures. A randomly chosen half of each class was taken from the classroom to the language laboratory where they listened to the latest revision of the nasal vowel *(on ... en ... ain)* program through earphones, but did not respond overtly. Following the discrimination training, this group engaged in laboratory practice in a manner similar to that described in Pilot Study 10. Finally, they took the post-test in which they recorded their reading of single words, pairs, and triplets.

The second half of each of these classes was taken to the laboratory after the first half had completed the entire experimental treatment. They received the same experimental treatment, except that during the discrimination training, they *did* respond overtly.

The pronunciation post-test was judged by two native French judges in the following manner: Each judge had before him a multiple-choice form listing the three possible alternatives for each item on the pronunciation test, e.g., *sont ... sent ... sain, vont ... vent ... vain,* etc. Using such a form for judging each student, the judge listened to the student's test recording and circles the alternative he thought the student had uttered. A student's score was the number of items on which the judge had understood him correctly.

Results. No significant difference was found between the two groups. However, the means were in the expected direction (32.8 for the group which did not respond overtly; 38.0 for the group which did). The effect may have been present but not detected in this experiment due to the shortness of the training session, the relative grossness of the pronunciation criterion, or one of a number of other possible factors. It was felt that the hypothesis was worth pursuing in future research, as part of the general question of the relationship between listening and speaking (see Lane, 1961C). However, it could not be handled within the limits of the present experiment.

Summary

Eleven Pilot Studies were conducted, involving more than one thousand students in all. They had permitted evaluation and refinement of discrimination training methods, choice of pronunciation problems to investigate, materials to be used in training and in laboratory practice, laboratory practice techniques, methods of judging pronunciation, recording techniques, and techniques of administering the experiment. The original hypotheses of the year's study had now been restated and were ready for a powerful empirical test in the final experiments.

CHAPTER 3

DISCUSSION OF SALIENT PROBLEMS

In the course of preparing and carrying out the eleven Pilot Studies and the three final experiments, the experimenters faced a number of problems which required thoughtful consideration, and explored a variety of solutions. Since the same problems confront other language specialists, it may be of value to include a discussion of them at this point. The issues to be dealt with are:

a. Defining and testing discrimination.
b. Training discrimination.
c. Evoking student oral responses.
d. Judging pronunciation.

a. Defining and Testing Discrimination

As work began on the project, it soon became clear that it was not fruitful to define discrimination in its popular sense, i.e., telling whether two stimuli are the same or different. Pilot Study 1 showed that, by the popular definition, untrained subjects could already discriminate. It was more to the point to describe the kinds of tasks that a person who can discriminate well should be able to perform. The tasks would then become operational definitions of what is meant by discrimination. In this way, a hierarchy of tasks was set up, each task having its own post-test. For example, in Pilot Study 3, the hierarchy of tests called for the subject to discriminate, first between two monosyllabic words said one after the other (e.g., *bain ... banc),* then between groups of words in which one element differed (e.g., *pond ... vent ... sont* versus *pond ... vent ... sent),* then between sentences in which one element differed (e.g., *Prends un banc ... Prends un bain).* These discriminations are all of the type in which two utterances are heard in succession, and a "same-different" judgment must be made. However, the fact that they do appear in succession makes the task too easy. Subjects may make an excellent score on such a test, but not be able to respond differently to the same stimuli presented in isolation.

A more exacting task is to teach a discrimination, say between *peau* and *pont,* and then ask the subject to tell whether *peau* or *pont* is uttered. The utterances may again be hierarchic, moving from a single word (e.g., *pont*) to a group of words (e.g., *vont ... bu ... pont ... banc*), to a short sentence (e.g., *Quel joli pont.*), to a longer sentence (e.g., *Le pont est tombé dans l'eau.*). What is essential here is that the subject must make a discrimination when not confronted with both members; he must correctly identify either member when it appears alone.

In these tasks, a range of discriminations is represented, from one that is too easy (e.g., *peau ... pont,* same or different?) to one that is too difficult (e.g., *Qu'est-ce qu'il en sait?,* does *en ... on ... ain* appear in that sentence?). The latter example is interesting in that the subject is actually required to do a more difficult job than a native speaker of French, for not knowing French, he does not have the context to help him. It was found in the pilot studies that, despite considerable training, subjects could not be taught to make such difficult discriminations with high reliability. Experience led us, therefore, to aim at training subjects up to a high degree of proficiency in a task somewhere between the easiest and hardest ones just described. Thus, in one of the final programs, subjects were trained to discriminate (that is, to circle the correct word) between words like *vend ... vont,* then between words like *vend ... vain,* then among *vend ... vont ... vain.* The training program to teach this three-way discrimination lasted about twelve minutes.

Working in this fashion, setting up tasks and then defining discrimination in terms of them, the following view of the meaning of discrimination in connection with foreign language pronunciation was finally

arrived at. It is a two-part process, only one part of which properly goes by the name discrimination. The proposition may be stated this way: mastering the phonemic system of the foreign language means learning to attach *differentiated responses* to *discriminative stimuli.* Let us first discuss the latter.

It is well known that a phoneme is not a single sound, but rather a collection of all those sound (phones) which are felt by native speakers to fit into a single category. The problem, then, is not to learn to discriminate among sounds; this is quickly learned, as shown by the way our subjects learned with very little training to tell the difference between French *o* and American o^{u} almost infallibly. Lane (1961B) has noted the same effect for Spanish. What is important is to learn the categories into which the foreign language classifies its sounds. This is a task of learning to group sounds appropriately. One learns what sound classes, or phonemes, exist in the foreign language and which sounds fit into these classes. Auditory discrimination plays only a small role, since most of the sounds are easily discriminable. In fact, it is perhaps equally important to learn *not* to discriminate sounds which are acceptable allophones. The task of mastering phoneme categories is one of "labeling" and has been found in a number of psychological experiments to have an important effect upon learning. (Albert, 1959; Norcross and Spiker, 1957; Reese, 1960; Brown, 1958.) Most pertinent is the work of Liberman, Harris, Hoffman & Griffith (1957), and of Griffith (1957). These experimenters found that sounds can be discriminated much more easily when they are in different phoneme categories than when they belong to the same category – even when the actual acoustic difference between them is the same. In the context of our experiment, the problem is to teach students that there are three categories of nasal vowels in French, /õ/, /ã/, and /ɛ̃/. The training begins by teaching them to correctly label a given sound in contrast with the others (reinforcing a labeling response to S^{D}, extinguishing the same response to S^{Δ}), and continues by teaching them to correctly identify a sound even in the absence of contrasting sounds. In order to tell whether the student is discriminating correctly, we have him make an overt response, circling a letter or a word. The training continues until the probability of a correct response is high, and the latency (delay) of the response is low. Then the student is said to be able to discriminate, by which we mean that he knows that there are three phoneme categories among French nasal vowels, and can assign a sound he hears to the right one of these categories with speed and accuracy.

We have said that the student learns to circle the right letter or word when he hears a French sound or word. But this is not really what we want; we don't want to teach students to circle words, but to pronounce them. The stimuli used in our discrimination training (spoken French words like *pain, pend, pont)* are really the responses we would like students to make. Fortunately, it appears that there is reversibility in the learning of paired associates. Among others, Feldman and Underwood (1957) and McCormack (1961) have shown that learning to give response A to stimulus B facilitates learning to give B in response to A. Our experiments appear to support these findings, in relation not only to paired associates consisting of single words, but in relation to whole categories of words. Learning when to circle the words *pain* and *main* at the same time teaches the student to pronounce these words when he sees them, and what is more, it also teaches him to pronounce other words like *vain, sain,* and even *maints* which he may never have seen.

Discrimination consists, then, of learning how the foreign language categorizes its phonemes, and this knowledge also helps one to learn to pronounce the phonemes. But this is not the whole process. We not only wish to have the students make a phonemic distinction among *pain, pend* and *pont,* we also wish him to produce acceptable allophones of each phoneme. This is what is commonly called pronunciation training. Harking back to our definition, this is the process which teaches students to make *differentiated responses.* Acceptable allophones are reinforced; unacceptable ones are extinguished. If a student says *pain* acceptably he is rewarded, if he says it unacceptably he is not rewarded; this goes on until he has a high probability of saying it acceptably every time. Note that this does not involve *when* to say *pain,* but only *how* to say it.

The relation of this part of the process to the other one – of differentiation to discrimination – is a

crucial one, but as yet unclear. It is crucial because discrimination can be readily taught in programmed fashion; differentiation, however, is far more difficult to teach without a teacher. Someone must judge whether an utterance is acceptable or not so as to reward only appropriate responses. In programmed instruction this judge must be the learner himself. The difficulty lies in the fact that the judgments required by the learner regarding the correctness of his responses require far more competence than the learner may possess. It appears that a solution is to make this judging process as simple a task for the learner as possible. It seems feasible that this might be accomplished by introducing echoic responses (taped practice sequences of the MODEL-STUDENT-MODEL type) for shaping of student vocal production. In these experiments, this was done in the usual language laboratory fashion, consisting of a unit of material (from six to fifteen words) which the student records in imitation of the model and to which he then listens. Limitations of present machine capabilities make this the most feasible method. But one may conjecture that it might be preferable to let the student make a particular vocal response in imitation of a model, and keep making this imitative response in repeated rapid-fire imitation, being caught up in the rhythm of the drill so that his pronunciation is shaped without the self-conscious reflection which so often hinders pronunciation improvement. Morton and Lane (1961) report promising results using echoic responses for training differentiation, but considerably more research is needed in this area.

b. Training Discrimination

As has been explained, it was found most feasible to work backward by first creating a discrimination post-test to serve as an operational definition and criterion of discrimination, and then writing a training program for this criterion. In making up the training programs, different experimental programs were written, tried out in the Pilot Studies, and retained, modified, or discarded on the basis of the results they yielded. The practice of building testing devices into every section of the programs made possible rather close analysis of their good and bad points.

In an early program, an attempt was made to teach discrimination by having the student learn to judge whether a given pronunciation was "acceptable" or not. The idea was to start off with pronunciations which were obviously discrepant from those of a native Frenchman, and gradually teach finer and finer discriminations until the student's judgment came to resemble that of a native. Considerable effort was expended in recording many native and non-native voices, and then piecing them together in prescribed ways to form the training program. This approach was found to be unfeasible, for native judges could not agree among themselves as to what constituted an "acceptable" pronunciation. Certainly they could have been made to agree on their standards, but any method of forcing agreement was deliberately avoided in these experiments, though other experimenters do so freely. It is felt that natives simply do not agree on their standards of what constitutes acceptable pronunciation in their language, and that any forced agreement is necessarily arbitrary and therefore introduces an element of invalidity. What is more, a very real danger exists that in forcing agreement among judges, the experimenter will unwittingly influence the results in favor of his hypothesis.

For the nasal vowel programs, the general procedure as it finally evolved consisted of (1) presentation of discriminative stimuli in the form of minimal pairs or triplets of words which the students listened to as they read along in their booklet; (2) a second run-through of the same material, in which students heard only one of the two (or three) words, decided which they had heard, and were told the correct answer; (3) a third run-through of the same words, in which students circled the word they thought they heard and were given the correct answer. The third run-through enabled the experimenter to obtain a record of performance at each stage of the program.

Each program consisted of several stages, each using the combined teaching-testing technique just described. For example, in the *on ... en ... ain* program, the students were first taught the *en ... on* distinction, then the *ain ... en* distinction which pilot studies had shown to be more difficult and which thus had more training items, and finally the three-way *on ... en ... ain* distinction.

While developing and refining the training program, various other steps were tried out and discarded, but deserve mention here. One of these attempted to drill the subjects explicitly on the *spelling* of the French words in the *on ... en ... ain* program, rather than rely on incidental learning. In one part of the program, for example, they saw the words *pend ... vont ... sent,* but heard the French voice say *pend ... vain ... sent,* and were required to make the correction *(vain* for *vont)* in writing in their booklet. This procedure, which was relatively time-consuming, was discarded when pilot studies showed it did not contribute appreciably to improving the subject's discrimination ability.

Another program step attempted to train students to discriminate sounds when they were embedded in a French sentence. For example, the student heard a sentence like *Ils vont tous là-bas* and was required to indicate (by circling his choice) whether *vont, vend,* or *vain* appeared in the sentence. It was hoped that the students might thus be brought up to a high degree of ability to discriminate. The pilot studies made it evident that, though some success could be achieved in this direction, it was incommensurate with the amount of training time required. Since the task is more demanding than what a native speaker has to do, in the sense that the students have no help from the context of the sentence, this overly ambitious objective was abandoned.

c. Evoking Student Oral Responses

The major hypothesis of the project states that student pronunciation will be better after one kind of training than after another kind. Consequently, the final criterion post-test must consist of some sort of pronunciation test. A major problem, then, is how to get a naive subject, who knows no French, to say a particular word at an appropriate time in the test situation. Or, in other words, how to set the occasion for a desired vocal response. One obvious answer is a mimicry test, in which the student repeats a word he has just heard said by a model speaker. But, this is not the major task of teaching foreign language pronunciation; a student must learn to say a word without benefit of a model. The idea of introducing interferences, such as a time lapse or a distractor utterance, also was considered, but were rejected as inconsistant with the test's validity. A valid test of pronunciation requires, not that a student be able to repeat what he has heard, but that he be able to emit his own utterances, without a model, at an appropriate time.

The idea of using French orthography was at first rejected. It was decided that using real French orthography would be interfered with by the subject's English spelling and pronunciation habits. An alternative was tried in the form of introducing English meanings. For example, subjects were taught that *banc* means *bench,* and *bain* means *bath.* When this had been learned, it was possible to give the instruction "Say the French word for *bath*" as a way of setting the occasion for the desired vocal response *"bain."* The trouble with this technique was that it was found difficult to teach any considerable number of vocabulary items in a limited period of time. Even after a fairly long training period involving only eight pairs, the subjects could not perform well. This poor performance appeared to result from lack of acquisition of English meanings; it did not seem to reflect a lack of ability to pronounce the French words. This technique had a further drawback in that the subjects can be tested only on the very items they have learned so that the results lack generality.

It was then decided that by judicious selection of pronunciation problems to be investigated, French words requiring very little knowledge of French orthography could be used. The nasal vowel distinction was selected as an appropriate pronunciation problem. Here many monosyllabic words are available involving only two orthographic rules. First, one and only one spelling is allowed for each nasal vowel sound; the spellings selected were *on ... en ... ain,* because they occur in the largest number of French words of the unchecked monosyllabic type. However, there are not enough words of the type *bon ... vain,* etc., so a second rule was introduced, namely, that in French, final consonants are not pronounced. This permits use of words like *tend ... vont ... maint.* Using only these simple orthographic principles, considerable experimental power was attained, for it became possible to find quite a few triplets of the kind *sont ... sent ... sain,*

pont ... pends ... pain, etc. Enough such triplets were available so that half of them could be used during the training session and the other half reserved for use in the post-test. Thus considerable generality was attained, for the post-test consisted not only of words which the students had already heard and practiced during the training phase, but also entirely new words, similar in form, but never previously encountered. With this technique, a large number of items were available for post-testing, merely by having the students read words like *vont ... main ... tend,* and so on. The experimenters realize the current trend to avoid writing at early stages of language learning, and appreciate the reasons which prompt it, but feel that the written words represented, for our purposes, the best available way to evoke student oral responses.

d. Judging Pronunciation

One of the thorniest problems encountered during the course of the year's research was that of judging the "adequacy" or "acceptability" or "accuracy" or "native-like quality" of a student's pronunciation. Since the major hypothesis was to be accepted or rejected in terms of scores on some measure of pronunciation ability taken after the treatment, it was of much consequence to the success of the experiment that a means be found to judge pronunciation both validly and reliably. This turned out to be no simple matter, for it was discovered that in judging pronunciation one is in constant danger of gaining reliability at the expense of validity. The reasons will be discussed here.

The first problem encountered was that of judging the accuracy of the French sound *u* (=[y]) as in */flute.* In order to construct a discrimination training program, samples were needed of pronunciations ranging from very poor to native. Some attempts were made to have French judges listen to tapes of American students saying words like */flute,* and ranking them with respect to the quality of the sound *u* in the words. It immediately became apparent that the natives did not agree in their estimation of a student's pronunciation, for a significant reason: *Most pronunciation errors do not vary along a single continuum.* It is not the case that the faults students have in their pronunciation are similar in kind, while varying in degree; instead they are like apples and oranges, they are just different faults. For example, in the case of */flute,* there are broadly speaking two kinds of errors American students make, though the concomitant problem of vowel length sometimes complicates matters. The two errors are: (1) substitution of an American for a French phoneme, thereby producing */floot,* as in English, and (2) production of a audible palatal glide, resulting in */flioot* (rhymes with *cute*). These two kinds of mistakes cannot be rated along a scale, for neither is worse than the other, they are simply both bad, viz., shocking to a native's ear. The experimenters could, of course, train the native judges to consider one of these mistakes worse than the other so that a student saying */floot* would get a score of 5 (on a scale where one is high and five is low), while one saying */flioot* would get a score of 4. This is an enticing solution, for it leads to high reliability in scoring. But, it must be realized that this reliability is achieved at the expense of validity, for the native judge's own sense of what sounds poor to him has been tampered with by the experimenter and made to follow an arbitrary rule. It seems inescapable that, in training judges to agree, the validity of their judgments diminishes. To avoid this pitfall, it appeared necessary to follow a principle: *Judges should not be trained to agree.* That is, the experimenter should only give them tasks to do in which their judgments tend to agree merely because they are native speakers.

Faced with the difficulty of obtaining agreement on pronunciations of */flute,* it was thought that a two-point scale, the simplest possible, might be effective. Judges were asked merely to rate the student renderings as "acceptable" or "unacceptable." This criterion, which was used in Pilot Studies 1 and 2, was soon abandoned, for there were always many borderline cases on which the judges could not agree. One of the findings in Pilot Study 2 gave some evidence of the lack of validity of this method of judging; students who had taken several semesters of French could do no better on this task than naive subjects.

Despite the foregoing, there may be situations in which it *is* possible to ask judges to rate pronunciation along a scale of quality. One of these, on which this research presents no evidence, is the case where

the judge can listen to a sample of the subject's natural speech in the foreign language, and give an overall judgment as to how pleasing it was to him. This project was concerned, however, only with small units of speech; single words, or at most two or three words unrelated in meaning. Another case where scaling may be feasible is that of pronunciations where the types of student errors (i.e., deviations from native speech) *do* vary along a single continuum. One of the problems chosen for the final experiment is a case in point.

The sound *o* as in *chaud,* unlike the *u* of (French) *flute,* is one which exists in both English and French. The point of articulation is quite similar in the two languages, but the mode of articulation is not; in an English word like *go,* the *o* glides rapidly during articulation roughly from *uh* to *o* to *oo,* while in a French word like *beau* it remains relatively stable or "pure." Though the length of the two may also differ, the English often being longer than the French, this variation usually accompanies the feature of diphthongization, and consequently is not to be judged independently. In a case of this sort, it does seem feasible to ask judges to rate student pronunciation of words like *chaud* and *saut* along a scale. Here, goodness of pronunciation is mainly a function of the degree of diphthongization. This was the case in Experiment I, where two judges rated student pronunciations on a seven-point scale. To guard against a possible halo effect, the test was divided into four parts; these were judged at different times so that four relatively independent judgments of each student's pronunciation were obtained from each judge. The inter-judge reliability was found to be .84. By using this method, the validity of the judgments seem to have been maintained, for the judges were not trained by the experimenter except to the extent of being exposed to samples of pronunciations of various qualities.

The set of training materials used in Final Experiments IIA and IIB involved quite a different pronunciation problem; namely, the French nasal vowel sounds *en ... on ... ain,* as in *pend ... pont ... pain.* Here, the range of possible errors in student pronunciation is greater than for the *o* of *chaud* or the *u* of *flute;* therefore, the problem lends itself less well to judging on a rating scale. The complexity of the problem is due to the fact that a student's pronunciation of *en ... on ... ain* may be defective in at least two major ways, and that these two possible defects are relatively independent of each other. The point of articulation may be wrong (too high or low; too far front or back), and the nasality may be wrong (denasalization, over-nasalization). Judges cannot be expected to be expert enough phoneticians to judge these factors separately, and yet the confusion of them may make for arbitrary decisions which lead to loss of validity. Therefore, an entirely different criterion was adopted for this pronunciation problem. The criterion is one of comprehensibility. The judges listen to a student's recording, and are asked to note what words they hear; this process is simplified by means of a scoring form. A student's score reflects the degree to which the judges understand the words he is trying to pronounce. This in turn reflects the extent to which the student has correctly "internalized" the phonemic system of French. This scoring method has both advantages and disadvantages. It does not tell us how good a student's accent is, but only whether he is understandable. But, it has the merit of providing a means of rating pronunciation which is both valid and reliable. Validity is assured by the fact that the judgment made is one of which any native speaker is capable. The inter-judge reliability obtained by this method was found to be .87. The favorable results yielded by this scoring technique led to its adoption in final experiments IIA and IIB.

CHAPTER 4

FINAL EXPERIMENTS

This project was undertaken to investigate the notion that discrimination training coupled with language laboratory practice will bring about better pronunciation than laboratory practice alone. However, this effect, even if it exists, may not be the same for all features of French pronunciation. For this reason, complete experiments were carried out to test the effects of discrimination training upon two quite different pronunciation problems: the phonetic problem of French *chaud* versus American *show,* and the phonemic problem of distinguishing among *en ... on ... ain.* Experiment I concerns the former, Experiments IIA and IIB, the latter.

As has been explained, the materials and procedures for the final experiments were tried out during the course of the year, in a number of Pilot Studies. Before running the experiments, it was assured that the discrimination training program really worked, that the laboratory practice materials were satisfactory with regard to examples and pacing, that tests of appropriate length and difficulty were available for testing discrimination and pronunciation, that the procedures for judging pronunciation yielded valid and reliable scores, that our entire experimental sequence could be run within a fifty-minute class hour, and that smooth administration of the experiment could be guaranteed. The reward for the long and painstaking effort of preparation was that the final experiments contain a minimum of factors which might cast doubt upon results.

The total experimental time for a group of subjects was a standard fifty-minute class period. Each period was divided into three portions. The general design of each of the experiments, presented schematically is as follows:

	Experimental Group	*Control Group*
(a)	Discrimination Training	Control Treatment
(b)	Laboratory Practice (same as Control)	Laboratory Practice
(c)	Pronunciation Test (same as Control)	Pronunciation Test

It had originally been thought to test subsidiary hypotheses by adding additional variables such as IQ and language aptitude. However, it was felt upon reflection that the best experimental strategy was to simplify the design so as to test the major hypothesis in as clear and unambiguous a manner as possible. The job of this project is to determine whether, for certain pronunciation problems, discrimination training leads to better pronunciation. Should the results be positive, then the interaction of this effect with other variables may be studied in later research

Final Experiment I

This experiment involved phonetic discrimination between the French sound *o* as in *chaud,* and the typical American student's pronunciation with a diphthongized o^u, as in *show.*

Hypothesis. With regard to monosyllabic French words ending in *o,* it is hypothesized that students who are trained to discriminate good from poor pronunciations of such words before they practice pronouncing them in a language laboratory will achieve better pronunciation than students who do not receive such discrimination training.

Subjects. The subjects were 144 eleventh-grade students in seven summer-school driver education classes. There were 77 boys and 67 girls. With respect to language experience, about one-sixth of the subjects had taken French (one to eight semesters; average four semesters); somewhat more than half had taken Spanish (one to eight semesters; average four semesters); about one-sixth had taken Latin or German (average two semesters); one-third had no formal language experience. The subjects' language experience will be taken into account in analyzing the data. The high school was located in a middle-class socio-economic area in Hermosa Beach, California, a suburb of Los Angeles.

Design. As each class of students arrived at the language laboratory, they were randomly assigned to two groups, the Experimental and the Control. The Experimental Group received the special discrimination training, laboratory practice, and the pronunciation test. The Control received the same procedure except that instead of discrimination training they received additional exposure to the laboratory practice materials. The experiment was carried out within a normal fifty-minute class period, the time spent on each portion of the experiment being identical for both the Experimental and Control Groups. The experiment was repeated for each of the seven class periods throughout the school day.

Language Laboratory Facilities. The experiment was carried out in a language laboratory equipped with 36 booths and a master console. Each booth contained a tape recorder, earphones, and a microphone. The master console was equipped with tape players and switches permitting the experimenters to direct programs to various booths as desired. The tape recorders were operated by each subject; after recording his voice, the subject could rewind the tape to a pre-marked point and listen back to his recording.

As most of the subjects had had no previous experience in using the laboratory, and as the experiment took almost the whole period, an efficient training method was required in order for the subjects to run their own equipment. This was accomplished with the help of twelve student assistants experienced in the operation of the laboratory. Each assistant was assigned to help three subjects as the experimenter directed the proceedings from the console. The assistants had no knowledge as to the nature and purposes of the experiment. The arrangement functioned well and provided a smooth-running standardized procedure.

Procedure and Materials. The materials consisted of tapes and mimeographed sheets developed in the course of the year and tried out in Pilot Studies 7, 8, and 10. In Appendix A will be found, for each treatment, a transcript of the taped program presented to the subjects and the accompanying mimeographed material. The treatments included: (a) discrimination training for the experimental group, and exposure for the control group; (b) laboratory practice; and (c) pronunciation test.

The discrimination training for the experimental group used the five French words *chaud ... sauts ... beau ... faux ... chaux* and their English counterparts, *show ... sew ... bow* (-tie) ... *foe.* A subject had before him a list of the French words just mentioned, numbered from 1 to 30, each appearing six times in random order. He followed down this list, hearing each word said twice, first by a native French voice and then "mispronounced" by an American. (The American was actually pronouncing an English counterpart word.) On the second run-through, the subject heard each word pronounced and was asked to decide whether he thought the pronunciation was French or American. He was then told the correct answer and allowed to hear the word again. On the third and final run-through, he heard each word pronounced, and was to circle the letter "F" or "A" to indicate whether he thought the pronunciation to be French or American; this time he was not given the correct answer. The experimenter thus obtained a measure of the subject's ability to discriminate good from poor pronunciation of the French words.

The tape heard by the Control Group while the Experimental Group was receiving discrimination training was a modification of the laboratory practice described below. Subjects were instructed to listen to the words and read them silently from the page as they were pronounced by native voices. Thus the Control

Group had approximately the same amount of exposure to the words as the Experimental Group, both in written and spoken form. The principal difference in the Control treatment was that only native French pronunciations of the words were presented.

The next portion of the experiment was laboratory practice which was the same for all subjects. Each student heard a word pronounced by a native French voice while reading this word from the page; then he said the word aloud himself, recording it onto his tape. After fifteen such items, he listened back to the recording, hearing the native pronunciation and his own. The same French words were used in the laboratory practice as in the previous training section.

The final part of the experiment was a pronunciation test taken by all subjects. A subject had a list of French words before him, and read item-by-item from this list as a taped voice gave the numbers; the numbers and the student pronunciations were recorded on each subject's tape for later scoring. The test contained sixty items: forty single words, ten three-word items. To the five French words used in previous sections of the experiment were added five new words similar to the others, but which the subjects had never seen before: *maux ... taux ... faut ... saut ... vaux.* These were included so that in the event of positive findings it would be possible to determine whether the effect generalized to new words.

Scoring. Two native French judges scored the pronunciation test tapes independently. They received (from a tape) preliminary instructions regarding procedure and the criterion for scoring (see Appendix A for these instructions for the judges). There were ten two-hour scoring sessions; the instruction tape was played at the beginning of each. The criterion the judges were instructed to employ was degree of diphthongization; they heard examples ranging from very American pronunciations of the word *chaud* to almost authentic French ones. They were trained only in that they became acquainted with the range of possible pronunciations they might hear.

During actual scoring, the two judges, who were separated by a partition, listened simultaneously to a student's recording played through a loudspeaker. They heard one part (out of four) of the test and scored it on a scale from 1 (worst) to 7 (best). The four parts of each test were interspersed in such a way that four independent judgments were obtained of each subject's pronunciation. A total of a subject's four scores was obtained from each judge. The inter-judge correlation was .84, indicating high inter-judge reliability.

Discrimination Test. The end of the discrimination training provided a test of a subject's ability to discriminate between diphthongized and undiphthongized *o*. Results obtained during this experiment confirmed those of the Pilot Studies, i.e., the mean for the Experimental Group on a sixteen-item test given at the end of the discrimination training was 13.3, indicating high ability to discriminate. Pilot Studies had shown that untrained subjects cannot discriminate as well.

In this experiment, the discrimination test was also administered at the end of the entire experimental procedure, this time to all subjects. A measure was thus obtained of differences in discrimination ability demonstrated by the subjects while they were taking the pronunciation test. The mean for the Experimental Group was 14.1, while the mean for the Control Group was 12.8. While eighteen subjects in the Experimental Group achieved perfect scores, only one Control subject did so.

Results. The eight scores assigned to a subject on the pronunciation test by the two judges provided an average score for each subject. The mean for Experimental Group subjects was 25.97; the mean for Control Group subjects was 25.45. An analysis of variance showed that the difference between the two groups was not statistically significant. ($F = .15$; $N_1 = 1$; $N_2 = 142$.) The data was analyzed again, omitting all subjects who had previously studied French; again no significant difference was found. Further analysis

was done on the thirty-one subjects who had no formal foreign language study at all; no significant difference was found.

With regard to monosyllabic French words ending in *o*, it has not been demonstrated that students who are trained to discriminate good from poor pronunciations of such words before they practice pronouncing them in a language laboratory will achieve better pronunciation than students who do not receive such discrimination training. The implications of this finding will be discussed in the section on conclusions.

Final Experiment IIA

This experiment involved phonemic discrimination among the three French nasal vowels *en ... on ... ain,* as in the French words *pend ... pont ... pain.* Experiment IIB is a replication, with one modification, of Experiment IIA.

Hypothesis. With regard to monosyllabic French words containing the nasal vowel phonemes *en ... on ... ain,* it is hypothesized that students who are trained to discriminate among such words before they practice pronouncing them in a language laboratory will achieve better pronunciation than students who do not receive such discrimination training.

Subjects. In Experiment IIA, the subjects were 96 eleventh-grade high school students from five history classes. There were fifty-three boys and forty-three girls. Somewhat more than half were Negro. With respect to language experience, thirty-two subjects had one to seven semesters of Spanish (average 2.6 semesters); eleven subjects had one to four semesters of Latin (average two semesters); the remaining fifty-three subjects had no formal foreign language background. French was not taught at this high school. The school was located in a lower-middle class socio-economic area in Compton, a suburb of Los Angeles, California.

Design. As each class of students arrived at the language laboratory, the subjects were randomly assigned to two groups, Experimental and Control. A new random designation was made each hour. During each class period the Experimental Group received the discrimination training, laboratory practice, and pronunciation test. The Control Group was given the same laboratory and pronunciation as the Experimental Group, but in place of discrimination training, the Control Group received additional exposure to native French voices which pronounced the words used in the experiment; they listened and read along silently. The experiment was run within a normal fifty-minute class period and the time spent on each portion of the experiment was identical for both groups.

Language Laboratory Facilities. The experiment was carried out in a language laboratory equipped with thirty-six booths and a master console. Each booth contained a magnetic disk recorder, earphones, and a microphone. The master console was equipped with tape players and switches permitting the experimenters to direct programs to various booths as desired.

As most of the subjects had had no previous experience using the laboratory, the procedure of using assistants, as in Experiment I, was continued. Twelve student assistants, experienced in the operation of the laboratory, were used all day long. Each assistant was assigned to help three subjects as directed by the experimenter from the console. These assistants were given no information as to the nature and the purpose of the experiment. The arrangement functioned well and provided an effective method of helping subjects to operate the laboratory equipment in a standard fashion.

Procedures and Materials. The materials consisted of tapes and mimeographed sheets developed in the course of the year and tried out in Pilot Studies 5, 6, 8, 9, and 11. In Appendix B will be found, for each treatment, a transcript of the taped commentary presented to the subjects and the accompanying

mimeographed material. The experimental procedure includes: (a) discrimination training and control treatment; (b) laboratory practice; and (c) pronunciation test.

The discrimination training was conducted for the experimental group in several parts, the same programing being followed in each. Part 1 dealt with the discrimination *en ... ain;* Part 2 with *en ... on;* Part 3 with the three-way discrimination *en ... on ... ain.* In Part 1, the subjects saw in their booklet six minimal pairs of *en ... ain* words: *vent ... vain, pend ... pain,* etc. They first listened and read along as the pairs were pronounced by a native voice. Next the native voice said one word of each pair, and the subject was to decide which of the two words he thought it was; he was then told the correct answer and heard the word again. Finally, the voice again said one word of each pair, and the subject was to circle his choice in the booklet. He again was given the correct answer, but was instructed not to change his answer even if it had been wrong; the experimenter thus retained a record of his discrimination ability on the final run-through. Part 2 of the discrimination training treated the *en ... on* discrimination, which had been found to be more difficult during the Pilot Studies. The identical training procedure was used, except that there were ten items instead of six. Part 3 treated the total *en ... on ... ain* discrimination. The procedure was identical with that of the previous parts, except that ten items were used, three words for each item (e.g., *pend ... pont ... pain)* were in the mimeographed booklet. The last run-through of this part of the training, on which the subject circled his choice of answers, yielded a record of his ability to make the full discrimination.

A control treatment resembling the laboratory practice material was administered to the Control Group while the Experimental Group was receiving the discrimination training. In the control treatment, the subjects saw in their booklet a list of words containing the sounds in question. They read along silently as a native voice pronounced these words one by one. Thus, the Control subjects were exposed to the same words as the Experimental subjects, the difference being that the discrimination training program *organized the words so as to make the discriminations manifest,* while the control program merely presented them in random arrangement. The Experimental Group also received reinforcement for making correct discriminations which the Control Group did not (viz., the Experimental Group received information as to the correctness of their responses).

The laboratory practice was identical for both the Experimental and Control Groups. A narrator instructed the subjects to follow along in their booklet as a native voice pronounced each word, and to pronounce the word aloud after the native. Both native and student pronunciations were recorded on the disc recorder in each booth. After six such items, the subject was instructed to listen back to the recording, comparing his pronunciation with that of the native. There were six parts of six items each.

The final part of the treatment was the pronunciation test. A taped narration instructed the subjects to read and pronounce the words listed in their booklet. The narrator said a number in English, whereupon the subjects were to pronounce the appropriate French word. Both the numbers and the students' pronunciations were recorded on the discs in each booth. The words used in the pronunciation test were the same as those used during training and laboratory practice. The test was in two parts: First, fourteen single-word items, then twelve two-word items.

Scoring. The scoring of the pronunciation post-test discs was done independently by two native French judges at different times. The criterion used was the comprehensibility of the subject's pronunciation. A multiple-choice scoring form was prepared on which the three alternatives *en ... on ... ain* were provided for each item. A judge played the student's disc and decided, for each word, which of these three phonemes the student had pronounced; he marked his choice on the scoring form. These forms were later compared with the list from which the subjects had read; the number of items on which the subject had been correctly understood by a native judge was recorded and the total of this score for the two judges was his final score. The judgment of the subjects' pronunciation was therefore not one of how accurate each phoneme was but whether the three-way phonemic distinction was satisfactory. This point was discussed earlier in the section on judg-

ing pronunciation. The reliability of this scoring procedure was found by correlating the scores assigned by one judge with those given by the other. The inter-judge reliability was found to be .87 for this sample of 96 students.

Discrimination Test. In Experiment IIA, the meanscore of the Experimental Group on the discrimination test was 6.38, as against a chance score of 3.33, and maximum possible score of 10. It appears that the discrimination training had taught the subjects to discriminate fairly well. It was not possible to test the Control Group on discrimination since the test itself would have constituted training.

Results. A student's score in the pronunciation post-test was the sum of the judgments received from two judges; the maximum score was thus seventy-six.

In Experiment IIA, the mean score for the Experimental Group on the pronunciation test was 32.5 with a standard deviation of 10.0; the mean score for the Control Group was 24.8 with a standard deviation of 8.9. The difference between the means is significant beyond the .01 level. ($F = 12.53$; $N_1 = 1$, $N_2 = 95$.)

Final Experiment IIB

In the previous experiment, Experiment IIA, while the Experimental Group was receiving its special discrimination training, the Control Group was given a modified form of language laboratory practice. These control subjects were giving an opportunity to rehearse and study each word silently as they would during the next instructional period, the language laboratory practice. Because this procedure required a pause following each word, the number of times students heard the French word sounded was far less than that of the Experimental Group. The positive results obtained in Experiment IIA might, therefore, be ascribed to the fact that the control students were not exposed to the authentic pronunciation of the French words as much as the Experimental Group. To control for this "exposure" effect, Experiment IIB was conducted. For this experiment, the preliminary training of the Control Group was modified so that they were given exactly the same number of exposures to the sounds of the French words as the Experimental Group received in their special training. Experiment IIB in all other respects was conducted exactly as Experiment IIA. Both of these experiments were conducted at the same high school and in the same language laboratory.

Hypothesis. The hypothesis of this study was the same as that of Experiment IIA.

Subjects. The subjects were 196 eleventh-grade students from six history classes. Approximately two-thirds of the subjects were Negro; many of the remaining third were of Mexican-American descent. Eighty-two subjects had one or more semesters of Spanish, twelve subjects had had one or more semesters of Latin, and 102 subjects had had no formal foreign language background. None of these subjects had participated in the previous experiment, Experiment IIA.

Procedures. The procedures used for this experiment were identical with those of Experiment IIA. Students from each of six classes appeared at the language laboratory for the experiment during the school day. Students were assigned at random to either the Control or Experimental Group.

Materials. The materials used for this study were exactly the same as those used in Experiment IIA except, of course, for the materials used in the preliminary training for the Control Group. Appendix B presents a copy of the mimeographed material used by the Control Group and a transcript of the commentary they heard. All of the materials for the Experimental Group are also found in Appendix B since the entire experimental treatment was identical with that used in Experiment IIA.

Scoring. The scoring procedures for this experiment were identical with those used for the previous experiment.

Discrimination Training. On the final ten items given during the discrimination training, the Experimental Group made a mean score of 6.2. In an effort to assess how well the control subjects could discriminate, these final items were given a second time as a discrimination post-test to all subjects in one of the classes after the experiment was completed. The class period for this class was somewhat longer than the usual fifty minutes and permitted the collection of these additional data. The seventeen subjects in the Experimental Group of this class achieved a mean score of 6.2 while the eighteen subjects in the Control Group made a mean score of 5.7. The difference is not significant, partly because of the small number of cases involved, but it is in the expected direction. It appears, however, that the Control Group had attained some ability to discriminate through their exposure to the materials throughout the experiment.

Results. In Experiment IIB the mean score for the Experimental Group was 36.0 with a standard deviation of 11.1, while the mean for the Control Group was 28.9, with a standard deviation of 9.0. This difference is significant beyond the .001 level ($F = 23.75$; $N_1 = 1$, $N_2 = 194$).

The results from both the Experiments, IIA and IIB, indicate that, with regard to monosyllabic French words containing the nasal vowel phonemes *en ... on ... ain,* students who are trained to discriminate among such words before they practice pronouncing them in a language laboratory will achieve better pronunciation than students who do not receive such discrimination training even though they read the words and "listen" to the correct pronunciations as often. The implications of this finding will be discussed in the section on conclusions.

CHAPTER 5

CONCLUSIONS AND DISCUSSION

The central problem of this research was to determine the value of preliminary discrimination training in increasing the effectiveness of language laboratory practice on the pronunciation of French sounds. The chief experimental findings were these: (1) Training in discriminating the French nasal vowel phonemes /õ/, /ã/, /ɛ̃/, rendered subsequent language laboratory practice more effective in producing good pronunciation of these phonemes. (2) Training in discriminating between the dipthongized and the undipthongized final /o/ did not render language laboratory practice measurably more effective in producing good pronunciation of this French phoneme.

Any experimental result applies, in the strictest sense, only to the particular methods, materials, and population studied. With this in mind one may proceed to generalize with caution following a line of reasoning suggested by the eleven pilot studies, Experiments I, IIA, and IIB, and current literature.

In Chapter 3, the following formulation was proposed; the problem of learning to pronounce a foreign language is one of learning to make differentiated responses to discriminative stimuli. The responses are phonemes of the foreign language spoken aloud by the learner. They are differentiated in the sense that only acceptable phones (sounds) are, or ought to be, produced. The stimuli are classes of situations which set the occasion for a given class or oral responses.[1] These stimuli are discriminative because they belong to categories which differ with respect to sounds. Thus *main, sain,* and *vain* belong to the same stimulus class though they are unconnected in meaning. (The common human ability to make up rhymes with considerable ease lends some face validity to this formulation.) While discrimination and differentiation are both involved in learning to pronounce a foreign language, a particular pronunciation problem may require far more training in one process than in the other. It will not be unexpected, therefore, to discover that different training procedures are needed for different problems, depending on which of these processes – discrimination or differentiation – is dominant. This formulation helps explain the findings of the present experiments.

It is suggested that discrimination training was effective with the French nasal vowel phonemes because the problem in that case is mainly one of "labeling," i.e., learning what phoneme classes exist in French and what words fit into each class. The student is taught the classes, and then practices fitting one word after another into them; he is taught that *main, ment,* and *mon* are different words in French, each representing a phoneme class. Then he practices fitting new words like *vont, saint,* and *pend* into the already established classes. Because S-R learning is reversible (Feldman and Underwood, 1957; McCormack, 1961), this practice enables him to later pronounce the words he has thus learned to discriminate. The success of our subjects in this task may be taken as corroboration of this reversibility.

It is further suggested that discrimination training may have been ineffective with the French vs. American *o* because the problem was not one of discrimination but one of differentiation. Since this is a motor skill, it was improved by practice in making the necessary articulatory adjustments (i.e., lab practice), not by practice in classifying other people's pronunciation as good or bad (i.e., discrimination training). The fact that French people pronounce a pure *o* while Americans pronounce a diphthongized one is understood by all students after just a few examples, and so does not require a program of training. For a student to become proficient at saying a French sound, he must practice doing just that. Many analogies come to mind. It's easy to tell a baseball player to keep his swing level, but he must practice swinging a great deal before he can do it; practice in telling whether other players are swinging well or badly will benefit him little or

[1] Some psychological approaches would include in this analysis the role of mediating behavior; such mediation might consist of words, concepts, or "ideas" which act as the immediate occasions for the overt behavior.

not at all. This is only to say that practice is a necessary condition to skill in a motor task; it is not a sufficient one, for practice under no-feedback conditions may even be detrimental. The point being made here is not that it is a bad practice to make students aware of the differences between good and poor pronunciation, but merely that this does not seem to require a program of training, since students can hear most such differences after very few exposures. As to the efficacy of teaching students to discriminate native pronunciation from foreign pronunciation which comes ever closer to the native, nothing may be said about this. We did not test it, due to the impossibility of reliably ranking pronunciations in order of goodness.

The concept of auditory discrimination as the ability to tell two sounds apart was not applicable to either experimental problem, for both involved discriminations well above the difference limen. The present experiments, and those of Lane (1961B), indicate that the "same-different" discrimination is simply not pertinent to most problems of language learning, and that discrimination must be redefined along lines suggested above and in Chapter 3. The "same-different" discrimination may become pertinent when speech is rapid, e.g., in discriminating between *J'te dis* and *J'te l'dis.* However, at this level of progress in language learning, semantic context presumably supplements the purely acoustic cues to comprehension. (In a private communication, Professor K. L. Pike cites examples of very difficult discriminations he has encountered in field work with non-Indo-European languages.)

It was found in the pilot studies that students could not be trained to discriminate reliably beyond a certain point, namely the point at which a native speaker uses semantic rather than (or in addition to) acoustic cues. Thus, some students still failed, even after considerable training, in the task of telling whether *vont, vent,* or *vain* appeared in the sentence they heard: *Ils vont venir tout à l'heure.* (The students knew no French, of course.) However, this task is beyond the bounds of auditory discrimination, for the native speaker uses mainly contextual information in comprehending such a sentence. In the spoken frame *Ils (blank) venir tout à l'heure,* the conditional probability of finding *vont* is fairly high, as is that of finding *va,* while the probability of finding *vent* or *vain* is very low. A Frenchman who said *Ils vent venir* would be understood to have said *Ils vont venir.* Only in rare cases is the acoustic cue the sole determiner, as in *Ils sentent avec les nez* versus *Ils sont avec l'aîné,* spoken out of context.

The effectiveness of the discrimination training programs may in part be ascribed to the fact that students were required to make an overt response, circling the word they heard, and received immediate information as to the correctness of their response. It is felt these two elements, requiring a response and reinforcing it immediately, are aids to learning which should be applied more frequently in the language laboratory and in the classroom.

The argument that learning foreign language pronunciation consists of learning the foreign phoneme categories can theoretically be extended to all the segmental and supra-segmental features. A training procedure such as that used in Experiments IIA and IIB, thus extended, would presumably lead at least to proficiency in reading French aloud with a good accent, though this is hardly the chief goal of language teaching. However, the process does appear further generalizable to teaching students to *speak* French. In these experiments, a written symbol was "tied" to a sound through discrimination training, so that when he saw a written word like *pend* or *sain* the student could say it aloud in a comprehensible manner. Similar materials could use visual aids as cues in place of written words, e.g., a picture of a loaf of bread in place of *pain* to elicit /pɛ̃/, and the student be brought to mastery of the French phonemic system without the use of written words. This would introduce meaning and eliminate problems of interference from English spelling habits. One may also speculate about extensions of discrimination training on the morphological and syntactic levels. Such distinctions as *vous chantez / vous chantiez, il comprend / qu'il comprenne, il est grand / elle est grande* seem analogous to the task for which discrimination training was found to be effective, namely that of learning categories of responses and the classes of stimuli which control each. These considerations, while beyond the scope of the present project, have important implications both for classroom and for programmed instruction.

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APPENDIX A: FINAL EXPERIMENT I

Transcripts of Tapes and Mimeographed Material

Discrimination Training Tape
Discrimination Training Sheet

Control Treatment Tape
Control Treatment Sheet

Laboratory Practice Tape
Laboratory Practice Sheet

Pronunciation Test Tape
Pronunciation Test Sheet

Instructions for Judges

EXPERIMENT I

Transcript of Discrimination Training Tape for Experimental Group

You are going to learn today about one of the things that causes Americans to have an American accent when they speak in French. Look at Part 1 of your booklet. You will hear the first word pronounced by an American and then by a Frenchman.*

chaud . . . chaud — Listen again.
chaud . . . chaud
chaud . . . chaud

Now listen to the next word pronounced first like an American does, then like a Frenchman does.

vaut . . . vaut — Listen again.
vaut . . . vaut
vaut . . . vaut

Now we are going to go through the list of words. Each one will be said first by an American voice, then by a French voice. We will start with Number 3.

saut . . . saut — Listen again.
saut . . . saut
saut . . . saut

faux . . . faux — Listen again.
faux . . . faux
faux . . . faux

chaux . . . chaux — Listen again.
chaux . . . chaux
chaux . . . chaux

faux . . . faux — Listen again.
faux . . . faux
faux . . . faux

vaut . . . vaut — Listen again.
vaut . . . vaut
vaut . . . vaut

chaud . . . chaud — Listen again
chaud . . . chaud
chaud . . . chaud

sauts . . . sauts — Listen again.
sauts . . . sauts
sauts . . . sauts

vaut . . . vaut — Listen again.
vaut . . . vaut
vaut . . . vaut

*Italicized word in the American voice.

faut . . . faut — Listen again.
faut . . . faut
faut . . . faut

sauts . . . sauts — Listen again.
sauts . . . sauts
sauts . . . sauts

chaux . . . chaux — Listen again.
chaux . . . chaux
chaux . . . chaux

sauts . . . sauts — Listen again.
sauts . . . sauts
sauts . . . sauts

vaut . . . vaut — Listen again.
vaut . . . vaut
vaut . . . vaut

faux . . . faux — Listen again.
faux . . . faux
faux . . . faux

chaud . . . chaud — Listen again
chaud . . . chaud
chaud . . . chaud

vaut . . . vaut — Listen again.
vaut . . . vaut
vaut . . . vaut

chaux . . . chaux — Listen again
chaux . . . chaux
chaux . . . chaux

faux . . . faux — Listen again.
faux . . . faux
faux . . . faux

sauts . . . sauts — Listen again.
sauts . . . sauts
sauts . . . sauts

chaud . . . chaud — Listen again.
chaud . . . chaud
chaud . . . chaud

faux . . . faux — Listen again.
faux . . . faux
faux . . . faux

sauts . . . sauts — Listen again.
sauts . . . sauts
sauts . . . sauts

vaut . . . vaut — Listen again.
vaut . . . vaut
vaut . . . vaut

chaux . . . chaux — Listen again.
chaux . . . chaux
chaux . . . chaux

sauts . . . sauts — Listen again.
sauts . . . sauts
sauts . . . sauts

faux . . . faux — Listen again.
faux . . . faux
faux . . . faux

vaut . . . vaut — Listen again.
vaut . . . vaut
vaut . . . vaut

chaud . . . chaud — Listen again.
chaud . . . chaud
chaud . . . chaud

Now we will go through the list in Part 2. This time circle the letter "F" or the letter "A" to show whether you think the voice was that of a Frenchman or that of an American.*

vaut	F	A
chaud	F	A
faux	F	A
sauts	F	A
faux	F	A
vaut	F	A
saut	F	A
chaux	F	A
vaut	F	A
chaux	F	A
saut	F	A
faux	F	A
saut	F	A
vaut	F	A
chaux	F	A
faux	F	A

*The correct answer is underlined.

EXPERIMENT I

Mimeographed Discrimination Training Sheet for Experimental Group

Part 1

1. chaud
2. vaut
3. saut
4. faux
5. chaux
6. faux
7. vaut
8. chaud
9. sauts
10. vaut
11. faut
12. sauts
13. chaux
14. sauts
15. vaut
16. faux
17. chaud
18. vaut
19. chaux
20. faux
21. sauts
22. chaud
23. faux
24. sauts
25. vaut
26. chaux
27. sauts
28. faux
29. vaut
30. chaud

Part 2

1. vaut	F	A
2. chaud	F	A
3. faux	F	A
4. sauts	F	A
5. faux	F	A
6. vaut	F	A
7. saut	F	A
8. chaux	F	A
9. vaut	F	A
10. chaux	F	A
11. saut	F	A
12. faux	F	A
13. saut	F	A
14. vaut	F	A
15. chaux	F	A
16. faux	F	A

EXPERIMENT I

Transcript from Tape for Control Group Exposure

Look at Section A in your booklet. You will hear a French speaker pronouncing the words you see in Section A. Just listen quietly to the words as they are pronounced. Here is Number 1.

chaud
vaut
sauts
faux
chaux
faux
vaut

The next is Number 8.

chaud
sauts
vaut
faux
sauts
chaux
sauts
vaut

Now let us go on to the next part. Look at item Number 16. There are two words. . . . Let's begin.

faux . . . chaud
vaut . . . chaux

Here is Number 18.

faux . . . sauts
chaud . . . faux

Number 20.

sauts . . . vaut
chaux . . . sauts

22.

faux . . . vaut
chaud . . . sauts

Now let us go on to the next part. Starting with item Number 24, you will see that there are three words. . . . Let us begin with item Number 24.

faux . . . vaut . . . sauts
vaut . . . chaux . . . faux
chaux . . . sauts . . . vaut

27.

sauts . . . chaud . . . faux
vaut . . . sauts . . . chaux
chaud . . . vaut . . . sauts

Stop your recording.

EXPERIMENT I

Mimeographed Control Group Exposure Sheet

Section A

1. chaud
2. vaut
3. sauts
4. faux
5. chaux
6. faux
7. vaut
8. chaud
9. sauts
10. vaut
11. faux
12. sauts
13. chaux
14. sauts
15. vaut

16. faux . . . chaud
17. vaut . . . chaux
18. faux . . . sauts
19. chaud . . . faux
20. sauts . . . vaut
21. chaux . . . sauts
22. faux . . . vaut
23. chaud . . . sauts
24. faux . . . vaut . . . sauts
25. vaut . . . chaux . . . faux
26. chaux . . . sauts . . . vaut
27. sauts . . . chaud . . . faux
28. vaut . . . sauts . . . chaux
29. chaud . . . vaut . . . sauts

EXPERIMENT I

Transcript of Laboratory Practice Tape

Now you are going to practice saying some French words. Look at the list of words in front of you. You will hear each word said by a French voice, then there will be a short pause for you to say the same word. Try to make your pronunciation as much like the French voice as you can. From time to time you will be able to listen back to your recording and compare your own pronunciation with that of the French voice. Now let's begin. You will repeat each word right after the voice, with as good pronunciation as you can. Here is Number 1.

chaud
vaut
sauts
faux
chaux
faux
vaut

The next is Number 8.

chaud
sauts
chaux
sauts
vaut

Stop your recording. Now you will be given instructions on how to rewind your recording so that you can listen back to yourself. Try to see how you can improve your pronunciation as much as you can.

Now let's go on to the next part. Look at Number 16. There are two words. You will hear both the words and you will repeat the two words right after. Let's begin.

faux . . . chaud
vaut . . . chaux

Here is Number 18.

faux . . . sauts
chaud . . . faux

Number 20.

sauts . . . vaut
chaux . . . sauts

22.

faux . . . vaut
chaud . . . sauts

Stop your recording. You will be given time now to go back and listen to what you have just recorded in Part 2, trying to see how to improve it and to make your pronunciation as much like the French as possible.

Now, let us go on to the next part. Starting with item Number 24, you will see that there are three words. You will hear the three words and then there is a pause for you to repeat all three. Remember, you are trying to imitate the French pronunciation to get as good pronunciation as you can. Let us begin with Number 24.

faux . . . vaut . . . sauts
vaut . . . chaux . . . faux
chaux . . . sauts . . . vaut

Number 27.

sauts . . . chaud . . . faux
vaut . . . sauts . . . chaux
chaud . . . vaut . . . sauts

Stop your recording. Once again as before, go back and listen to the items starting with 24. Try to see how to improve your pronunciation now as much as you can.

EXPERIMENT I

Transcript of Pronunciation Test Tape

Turn to the page called "Section B." In Part 1 notice the list of twenty words. I will say the first number and you pronounce the first word. Then I say "2" and you will pronounce the second word. We will continue this way until we reach Number 20. Pronounce the words as best you can.

Number 1.
Number 2.
Number 3.
Number 4.
Number 5.
Number 6.
Number 7.
Number 8.
Number 9.
Number 10.
Number 11.
Number 12.
Number 13.
Number 14.
Number 15.
Number 16.
Number 17.
Number 18.
Number 19.
Number 20.

Now do the same thing for Part 2. Ready? Let's begin.

Number 1.
Number 2.
Number 3.
Number 4.
Number 5.
Number 6.
Number 7.
Number 8.
Number 9.
Number 10.
Number 11.
Number 12.
Number 13.
Number 14.
Number 15.
Number 16.
Number 17.
Number 18.
Number 19.
Number 20.

Now notice that in Part 3 that there are two words. When I say a number, pronounce both words. Ready?

Number 1.
Number 2.
Number 3.
Number 4.
Number 5.
Number 6.
Number 7.
Number 8.
Number 9
Number 10.

Now in Part 4 there are three words. Do exactly the same thing. I'll say the number and then you pronounce all three words. Ready?

Number 1.
Number 2.
Number 3.
Number 4.
Number 5.
Number 6.
Number 7.
Number 8.
Number 9.
Number 10.

EXPERIMENT I

Mimeographed Pronunciation Test Sheet

Part 1

1. chaud
2. vaut
3. chaux
4. sauts
5. chaud
6. vaut
7. sauts
8. faux
9. chaux
10. sauts
11. vaut
12. chaud
13. faux
14. chaux
15. faux
16. vaut
17. sauts
18. chaux
19. faux
20. chaud

Part 2

1. faut
2. maux
3. saut
4. vaux
5. taux
6. maux
7. vaux
8. faut
9. saut
10. taux
11. saut
12. maux
13. taux
14. vaux
15. faut
16. taux
17. saut
18. maux
19. faut
20. vaux

Part 3

1. maux . . . chaud
2. vaut . . . sauts
3. faux . . . chaux
4. saut . . . taux
5. faut . . . vaux
6. chaud . . . maux
7. vaut . . . saut
8. faut . . . chaux
9. maux . . . vaut
10. saut . . . faux

Part 4

1. faut . . . chaud . . . sauts
2. saut . . . maux . . . taux
3. vaut . . . faux . . . chaux
4. maux . . . vaux . . . saut
5. taux . . . faut . . . maux
6. faux . . . chaux . . . vaut
7. chaud . . . vaut . . . faut
8. vaux . . . saut . . . chaud
9. sauts . . . taux . . . faux
10. chaux . . . sauts . . . vaux

EXPERIMENT I

Instructions for Judges

On each section of tape you will hear the voice of a student pronouncing a list of French words. Listen to a section and then rate the student as to the over-all quality of his pronunciation of the French sound *o*. Pay no attention to any other aspect of his pronunciation such as pronunciation of consonants, speed and expression.

Pronunciation of the sound *o* will be rated on a scale from 1 to 7. Rate a section with the number 7 if you think the student's pronunciation of the sound *o* was as good as that of a native French speaker. Rate a section with the number 1 if you think the student has pronounced the sound *o* in a completely Americanized fashion. Make a score of 4 represent the quality of pronunciation given by the average student you will hear. But it is essential that your rating reflect the fact that the pronunciations of these students differ; hence, your rating should range widely from 1 to 7.

To help you establish standards for rating differences, you will now hear some examples. The voices you will hear first are students who are about average and would receive a rating of 4.

Now listen to voices of poor students who would receive a rating of 1 or 2.

Finally, now, listen to students who would receive a rating of 6 or 7.

Next, here are several practice tapes. Listen to a section and then make your rating. You will then be told how other judges have rated this section.

Feel perfectly free to ask questions as you rate your tapes.

APPENDIX B: FINAL EXPERIMENTS IIA AND IIB

Transcripts of Tapes and Mimeographed Materials

Discrimination Training Tape
Discrimination Training Sheet

IIA: Control Treatment Tape

IIB: Control Treatment Tape
IIB: Control Treatment Sheet

Laboratory Practice Tape
Laboratory Practice Sheet

Pronunciation Test Tape
Pronunciation Test Sheet

EXPERIMENTS IIA AND IIB

Transcripts of Discrimination Training Tape

Look at Part 1 in your booklet. You are going to hear the French voice say the words that are written there. Listen carefully and follow along with your eyes.

Number 1. ain . . . en
Number 2. vent . . . vain
Number 3. sain . . . sent
Number 4. ment . . . maint
Number 5. faim . . . fend
Number 6. pain . . . pend

And now you are going to test yourself. The French voice will say one of each pair of the two words, and you are going to try to think of the one she said. Don't write anything. I'll tell you each time what the correct answer is.

Number 1.	en . . . en en	That was the second word. Listen again.
Number 2.	vain . . . vain vain	That was the second word. Listen again.
Number 3.	sent . . . sent sent	That was the second word. Listen again.
Number 4.	maint . . . maint maint	That was the second word. Listen again.
Number 5.	faim . . . faim faim	That was the first word. Listen again.
Number 6.	pend . . . pend pend	That was the second word. Listen again.

And now let's do the same thing again; but, this time you are to circle the word you think you hear, and you will not receive the correct answer. Go back to Number 1, and this time circle the one of the two words that you think this French speaker has said. Let's begin.

Number 1. ain . . . ain
Number 2. vent . . . vent
Number 3. sain . . . sain
Number 4. ment . . . ment
Number 5. fend . . . fend
Number 6. pain . . . pain

Now let's go on to Part 2. Listen as the French speaker pronounces the words of Part 2.

Number 1.	en . . . on en . . . on	Listen again.
Number 2.	dont . . . dent	
Number 3.	vent . . . vont	
Number 4.	fend . . . font	
Number 5.	sont . . . sent	
Number 6.	pond . . . pend	
Number 7.	vont . . . vent	
Number 8.	on . . . en	
Number 9.	dent . . . dont	
Number 10.	sont . . . sent	

And now let's go back to the beginning, and this time the French voice will say one of the words. You try to think of the word that she has said, and then I'll tell you the correct answer. Try

Number 1.	en . . . en en	That was the first of the two words. Listen again.
Number 2.	dent . . . dent dent	That was the second word. Listen to it again.
Number 3.	vent . . . vent vent	That was the first word. Listen to it again.
Number 4.	font . . . font font	That was the second word. Listen to it again.
Number 5.	sont . . . sont sont	That was the first word. Listen to it again.
Number 6.	pont . . . pont pont	That was the first word. Listen to it again.
Number 7.	vent . . . vent vent	That was the second word. Listen to it again.
Number 8.	on . . . on on	That was the first word. Listen to it again.
Number 9.	dent . . . dent dent	That was the first word. Listen to it again.
Number 10.	sont . . . sont sont	That was the first word. Listen to it again.

And now, go back to Number 1 again of Part 2, and this time the French voice will say one of the two words and you are to circle the one you think she has said. This time you will not receive the correct answer. She will repeat each item twice.

Number 1.	on . . . on
Number 2.	dont . . . dont
Number 3.	vont . . . vont
Number 4.	fend . . . fend
Number 5.	sent . . . sent
Number 6.	pend . . . pend
Number 7.	vont . . . vont
Number 8.	en . . . en
Number 9.	dont . . . dont
Number 10.	sent . . . sent

And now let's go on to Part 3. This time there are three words together. Listen as the French voice pronounces them. Read along with your eyes.

Number 1.	en . . . on	. . . ain
Number 2.	vain . . . vent	. . . vont
Number 3.	sont . . . sain	. . . sent
Number 4.	fend . . . font	. . . faim
Number 5.	pond . . . pend	. . . pain
Number 6.	ain . . . en	. . . on
Number 7.	vont . . . vain	. . . vent
Number 8.	sent . . . sont	. . . sain
Number 9.	faim . . . fend	. . . font
Number 10.	pain . . . pond	. . . pend

This time the French speaker will go through the list again, and she will say one of the words in each item. You will try to think of the word that she said, and then I'll tell you the correct answer. Don't write anything.

Number 1.	ain . . . ain ain	That was the third word. Listen again.
Number 2.	vent . . . vent vent	That was the second word. Listen again.
Number 3.	sont . . . sont sont	That was the first word. Listen again.
Number 4.	faim . . . faim faim	That was the third word. Listen again.
Number 5.	pond . . . pond pond	That was the first word. Listen again.
Number 6.	en . . . en en	That was the second word. Listen again.
Number 7.	vont . . . vont vont	That was the first word. Listen again.
Number 8.	sont . . . sont sont	That was the second word. Listen again.
Number 9.	faim . . . faim faim	That was the first word. Listen again.
Number 10.	pend . . . pend pend	That was the third word. Listen again.

And now we'll go through the same list again, but this time the French speaker will say one of the three words, and you are to circle the one that you think she said. You will not be told the correct answer. She will say each item twice. Let's begin with

Number 1.	on . . . on
Number 2.	vain . . . vain
Number 3.	sont . . . sont
Number 4.	font . . . font
Number 5.	pond . . . pond
Number 6.	on . . . on
Number 7.	vain . . . vain
Number 8.	sain . . . sain
Number 9.	fend . . . fend
Number 10.	pain . . . pain

EXPERIMENTS IIA AND IIB

Mimeographed Discrimination Training Sheet

Section A

Part 1.

1. ain . . . en
2. vent . . . vain
3. sain . . . sent
4. ment . . . main
5. faim . . . fend
6. pain . . . pend

Part 2.

1. en . . . on
2. dont . . . dent
3. vent . . . vont
4. fend . . . font
5. sont . . . sent
6. pond . . . pend
7. vont . . . vent
8. on . . . en
9. dent . . . dont
10. sont . . . sent

Part 3.

1. en . . . on . . . ain
2. vain . . . vent . . . vont
3. sont . . . sain . . . sent
4. fend . . . font . . . faim
5. pond . . . pend . . . pain
6. ain . . . en . . . on
7. vont . . . vain . . . vent
8. sent . . . sont . . . sain
9. faim . . . fend . . . font
10. pain . . . pond . . . pend

EXPERIMENT IIA

Control Group Exposure

Turn to Section B in your booklet. Look at the list of words in Section B. You will hear each word said by a French voice. Follow along with your eye as you hear the words pronounced. Here is Number 1 of Part 1.

Number 1. en
Number 2. vain
Number 3. sent
Number 4. main
Number 5. fend
Number 6. pend

Here is Number 7 in Part 2.

Number 7. ain
Number 8. vent
Number 9. sain
Number 10. ment
Number 11. faim
Number 12. pain

Here is Number 13, beginning Part 3.

Number 13. on
Number 14. dent
Number 15. vont
Number 16. font
Number 17. sent
Number 18. pend

Here is Number 19 in Part 4.

Number 19. en
Number 20. dont
Number 21. vent
Number 22. fend
Number 23. sont
Number 24. pond

Here is Number 25 at the beginning of Part 5.

Number 25. on . . . ain
Number 26. vent . . . vont
Number 27. sain . . . sent
Number 28. font . . . faim
Number 29. pend . . . pain
Number 30. en . . . on

Here is Number 31 at the beginning of Part 6.

Number 31. vont . . . sain
Number 32. sent . . . font
Number 33. faim . . . pend
Number 34. pain . . . sain
Number 35. fend . . . pond
Number 36. vain . . . font

EXPERIMENT IIB

Transcript of Control Treatment Tape

Look at Part 1 in your booklet. You are going to hear a French voice say the words that are written there. Listen carefully and follow along with your eyes. Each word in the list will be repeated several times. Here are the words in Part 1.

ain . . . ain . . . ain
vent . . . vent . . . vent
sain . . . sain . . . sain
ment . . . ment . . . ment
faim . . . faim . . . faim
pain . . . pain . . . pain

Here is Part 2.

en . . . en . . . en
vain . . . vain . . . vain
sent . . . sent . . . sent
maint . . . maint . . . maint
fend . . . fend . . . fend
pend . . . pend . . . pend

Here is Part 3.

en . . . en . . . en
dont . . . dont . . . dont
vent . . . vent . . . vent
fend . . . fend . . . fend
sont . . . sont . . . sont
pond . . . pond . . . pond
vont . . . vont . . . vont
on . . . on . . . on
dent . . . dent . . . dent
sont . . . sont . . . sont

Here is Part 4.

on . . . on . . . on
dent . . . dent . . . dent
vont . . . vont . . . vont
font . . . font . . . font
sent . . . sent . . . sent
pend . . . pend . . . pend
vent . . . vent . . . vent
en . . . en . . . en
dont . . . dont . . . dont
sent . . . sent . . . sent

Here is Part 5.

en . . . en . . . en
vain . . . vain . . . vain
sont . . . sont . . . sont
fend . . . fend . . . fend
pond . . . pond . . . pond

ain . . . ain . . . ain
vont . . . vont . . . vont
sent . . . sent . . . sent
faim . . . faim . . . faim
pain . . . pain . . . pain

Here is Part 6.

on . . . on . . . on
vent . . . vent . . . vent
sain . . . sain . . . sain
font . . . font . . . font
pend . . . pend . . . pend
en . . . en . . . en
vain . . . vain . . . vain
sont . . . sont . . . sont
fend . . . fend . . . fend
pond . . . pond . . . pond

Here is Part 7.

ain . . . ain . . . ain
vont . . . vont . . . vont
sent . . . sent . . . sent
faim . . . faim . . . faim
pain . . . pain . . . pain
on . . . on . . . on
vent . . . vent . . . vent
sain . . . sain . . . sain
font . . . font . . . font
pend . . . pend . . . pend

EXPERIMENT IIB

Mimeographed Control Treatment Sheet

Section A

Part 1.

1. ain
2. vent
3. sain
4. ment
5. faim
6. pain

Part 2.

1. en
2. vain
3. sent
4. maint
5. fend
6. pend

Part 3.

1. en
2. dont
3. vent
4. fend
5. sont
6. pond
7. vont
8. on
9. dent
10. sont

Part 4.

1. on
2. dent
3. vont
4. font
5. sent
6. pend
7. vent
8. en
9. dont
10. sent

Part 5.

1. en
2. vain
3. sont
4. fend
5. pond
6. ain
7. vont
8. sent
9. faim
10. pain

Part 6.

1. on
2. vent
3. sain
4. font
5. pend
6. en
7. vain
8. sont
9. fend
10. pond

Part 7.

1. ain
2. vont
3. sent
4. faim
5. pain
6. on
7. vent
8. sain
9. font
10. pend

EXPERIMENTS IIA AND IIB

Transcript of Laboratory Practice Tape

Turn now to Section B of your booklet. Now you are going to practice saying some French words. Look at the list of words in front of you. You will hear each word said by a French voice, then there will be a short pause for you to say the same word. Try to make your pronunciation as much like the French voice as you can. From time to time you will be able to listen back to your recording and compare your own pronunciation with that of the French voice. Let's begin. You will repeat each word right after the voice with the best pronunciation you can. Here is Number 1 of Part 1.

Number 1. en
Number 2. vain
Number 3. sent
Number 4. main
Number 5. fend
Number 6. pend

Stop your recording. Now you will be given instructions on how to play back your recording so that you can listen to yourself. Try to see how you can improve your pronunciation as much as you can.

Now let's go on to the next part. Did you compare your own pronunciation carefully with the French voice? If you listen carefully, you should be able to improve your pronunciation on the next word. Here is Number 7 in Part 2.

Number 7. ain
Number 8. vent
Number 9. sain
Number 10. ment
Number 11. faim
Number 12. pain

Stop your recording. Again you will listen back to the words you have just pronounced. Watch the words carefully as you listen. Later, you will be asked to pronounce these words as you read them, so it is very important that you connect the sound of the word with the written word.

Here are the next words. Again, be sure to watch the words carefully as you pronounce them after the French voice so that later you will be able to read and pronounce them by yourself. Here is Number 13, beginning Part 3.

Number 13. on
Number 14. dent
Number 15. vont
Number 16. font
Number 17. sent
Number 18. pend

Stop your recording. Listen back carefully now to Part 3.

Can you see from listening how to improve your pronunciation? Try to improve your pronunciation in Part 4. Here is

Number 19. en
Number 20. dont
Number 21. vent
Number 22. fend

Number 23. sont
Number 24. pond

Stop your recording and listen back to Part 4.

In Part 5 the French voice will say two words that are written. Read and say the two words right after she does. Her is Number 25 at the beginning of Part 5.

Number 25. on . . . ain
Number 26. vent . . . vont
Number 27. sain . . . sent
Number 28. font . . . faim
Number 29. pend . . . pain
Number 30. en . . . on

Stop your recording and listen back to Part 5.

Here is Number 31 at the beginning of Part 6.

Number 31. vont . . . sain
Number 32. sent . . . font
Number 33. faim . . . pend
Number 34. pain . . . sain
Number 35. fend . . . pond
Number 36. vain . . . font

Stop your recording and listen back to Part 6.

EXPERIMENTS IIA AND IIB

Mimeographed Laboratory Practice Sheet

Section B

Part 1.

1. en
2. vain
3. sent
4. main
5. fend
6. pend

Part 2.

7. ain
8. vent
9. sain
10. ment
11. faim
12. pain

Part 3.

13. on
14. dent
15. vont
16. font
17. sent
18. pend

Part 4.

19. en
20. dont
21. vent
22. fend
23. sont
24. pond

Part 5.

25. on . . . ain
26. vent . . . vont
27. sain . . . sent
28. font . . . faim
29. pend . . . pain
30. en . . . on

Part 6.

31. vont . . . sain
32. sent . . . font
33. faim . . . pend
34. pain . . . sain
35. fend . . . pond
36. vain . . font

EXPERIMENTS IIA AND IIB

Transcript of Pronunciation Test Tape

Turn now to Section C in your booklet. This time you will read the words you have learned to pronounce without the French voice. I will say only the number and you will say out loud only the word that is printed next to the number. Pronounce the words just as you have learned to pronounce them. Beginning Part 1 now, read the word out loud as soon as I say the number. Ready?

Number 1.
Number 2.
Number 3.
Number 4.
Number 5.
Number 6.
Number 7.
Number 8.
Number 9.
Number 10.
Number 11.
Number 12.
Number 13.
Number 14.

Now, in Part 2, beginning with Number 15, read the two words out loud when I say the number. Let's begin now.

Number 15.
Number 16.
Number 17.
Number 18.
Number 19.
Number 20.
Number 21.
Number 22.
Number 23.
Number 24.
Number 25.
Number 26.

EXPERIMENTS IIA AND IIB

Mimeographed Pronunciation Test Sheet

Section C

Part 1.

1. vont
2. fend
3. sain
4. faim
5. pend
6. vain
7. sont
8. pond
9. sent
10. pain
11. vent
12. font
13. sent
14. on

Part 2

15. font . . . vain
16. on . . . en
17. fend . . . pond
18. pend . . . pain
19. sain . . . pain
20. faim . . . font
21. sent . . . font
22. font . . . pain
23. vont . . . pend
24. sain . . . vain
25. faim . . . sont
26. sent . . . pain

APPENDIX C: PROGRAMMING ACOUSTIC DISCRIMINATORY SKILLS

by

Paul Pimsleur

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PROGRAMMING ACOUSTIC DISCRIMINATORY SKILLS

by

Paul Pimsleur

The major hypothesis of this research is that students who have received discrimination training will profit more from subsequent language laboratory sessions than students who have not been so trained. Presumably, those who have learned to tell good from poor pronunciation in others will be better judges of their own pronunciation. Consequently they will derive more benefit from the type of laboratory exercise in which they record their pronunciation next to that of a native and then listen back critically to this recording.

The basic design for testing this hypothesis is the following:

	Experimental Group	Control Group
I.	Discrimination Training	No Training, Or Additional Laboratory Practice
II.	Laboratory Practice	Laboratory Practice
III.	Pronunciation Post-Test	Pronunciation Post-Test

My purpose today is not to report results, for the experiment is still in progress. Rather, I shall mention some of the difficulties encountered in preparing the experiment, since they have much in common with those involved in writing a teaching machine program in French.

The main areas of difficulty are these. First, the construction of the discrimination training program, which includes selecting the topics to be taught, writing a program, and demonstrating that it succeeds in teaching discrimination. The next stage, the laboratory drill, is relatively easy since it merely consists of exposure to native speakers saying French words of an appropriate type. However, Part III presents two sorts of difficulty: in order to test a student's pronunciation, we must find some way of eliciting his utterances. Then, having gotten him to say something, we must have a valid and reliable way of judging his pronunciation. The three problems of training discrimination, eliciting responses, and judging pronunciation are sufficiently current so that discussion of them may interest a number of language researchers. It may also be noted that the relevance of the discussion to teaching machine programming is heightened by the fact that all our attempts to deal with these problems were of a programmatic type, involving no intercession on the part of a teacher. One of our goals was to arrive at an effective teacherless program for teaching discrimination of French sounds. In preparing our main experiment, we have gone through ten Pilot Studies involving groups of high school students (college students in one of ten). The number of subjects in each experiment varied from 20 to 70. The results of these ten Pilot Studies permitted us to refine the techniques and materials, as will be described here.

Our first attempt to teach discrimination consisted of letting students listen to words like *vue* and *flute,* pronounced by a number of voices of both sexes, whose pronunciations varied from native French to a gross American accent. The possibility of asking students to rate them for goodness of pronunciation was considered, but soon rejected. Defects in the pronunciation of single sounds do not vary along any clear continuum. For instance, which is worse; to say [*flut*] or [*fljut*] instead of [*flyt*]? Consequently, the students were merely asked to learn to classify the utterances as "acceptable" or "unacceptable." However, this too proved unfeasible, since the native judges themselves could not agree on what constituted an "acceptable" pronunciation. It would, of course, have been possible to train the judges to agree, but this involves dangers, since to train them means to impose on them a particular set of more or less arbitrary standards. But what is the *validity* of these standards? That is, do they truly reflect the comprehensibility of the subject's

speech, or its elegance or what? Moreover, he is likely to prejudice the judging in favor of his hypothesis, without meaning to do so. In training judges to arrive at the same judgment, there is a very real danger of sacrificing validity for the sake of reliability.

Finding ourselves in an apparent impassé, we shifted our mode of attack. We reasoned that the eventual post-test would have to somehow elicit samples of pronunciation from the subjects and that this elicitation would reflect what had been taught to both Experimental and Control Groups earlier in the experiment. We therefore attacked the problem of how to elicit student utterances. One of the early methods we tried was that of teaching the subjects the English meanings of the words in the four minimal pairs: *vie . . . vue, pot . . . pont, but . . . boue,* and *bain . . . banc.* In this way, they could be asked to circle the word "life" or "sight" when they heard *vue,* and they could be expected to say *vue* when told to say "sight" in French. In a Pilot Experiment, it was found, however, that the time needed to teach a whole class the meanings of eight French words was prohibitive. It was also evident at this point that four problems of pronunciation were too many to handle. Our decisions on these points were: (1) to limit the study to two problems of pronunciation; and (2) to use actual French spelling to elicit utterances.

The two pronunciation problems were *on . . . en . . . ain, o . . . ou.* The former is a phonemic distinction, the latter a phonetic one. The former was chosen to see whether merely learning to discriminate among the sounds *on . . . en . . . ain* would lead to better pronunciation, even though the subjects would never hear anything but native pronunciation of these sounds. When a person is made aware of a phonemic distinction in a foreign language, will he zero in on an acceptable allophone by himself? The latter problem was the sound o as in *chaud.* There the subjects would learn to discriminate between good and poor pronunciation of words like *chaud . . . saut . . . beau.* An interesting question, subsidiary to the main hypothesis, may be stated like this: In terms of effectiveness and economy, should a discrimination training program deal with phonemic or phonetic distinctions? If both, then when the one and when the other?

As was mentioned, the use of actual French spelling was decided upon for the dual purpose of serving as a subject's response to sounds heard during the discrimination training, and as a stimulus to elicit sounds from him on the post-test. We taught just enough French orthography to be able to use real French words throughout the program. A wide variety of words can be formed with few rules, and without teaching anything artificial or incorrect. We selected the normal spellings *on . . . en . . . ain,* which permit the use of words like *bon* and *main.* As there are not enough of these, we added one simple rule: "In French, final consonants are not pronounced." Now we had many words at our disposal, like *sont . . . pains . . . fend,* etc. A list of ten triplets was set up, as follows:

on . . .	en	. . . ain
sont . . .	sent	. . . sain
pond . . .	pend	. . . pains
vont . . .	vent	. . . vain
font . . .	fend	. . . faim
son . . .	cent	. . . saint
dons . . .	dent	. . . daim
mont . . .	ment	. . . main
pont . . .	pends	. . . pain
tond . . .	tend	. . . tain

We could now both teach and test discrimination by saying one of these words to the subject and having him circle in his test booklet the one he thought was said. The first five of these triplets were used during the training and the last five were reserved for the post-test. Thus on the post-test we could determine not only whether discrimination training helped the subjects' pronunciation of the words they had learned, but also whether this effect generalized to other words, similar in form, but which they had never seen before.

It was now possible to construct the discrimination training program. The point is to teach the subjects to discriminate among words like *pond . . . pends . . . pain.* First we take two sounds, *en* and *ain.* The students listen to a list of ten such pairs as they are spoken by a native: They read along in their booklet.

The next time around, they hear one member of the pair, and must decide which they think it is before they are told the correct answer. Then they are allowed to hear the pair again. The third time around, they hear one word, and must circle the one they think it is. They are told the correct answer, but prevented from changing their answer, so that we retain a record of their choice. This record serves as a measure of their ability to discriminate. This procedure is followed, first with pairs like *pends . . . pains,* then with *pond . . . pends* (this is considerably more difficult) and finally the three-way distinction; *pond . . . pends . . . pains.* At each point in the program, there is a measure of the student's discrimination ability in the form of the words he has circled on the third run-through. That the procedure works is attested by the fact that the most recent Pilot Study conducted in 2 eleventh-grade classes (total number was 47), yielded a mean score of 8.19 out of 10 on this section. Though this is a good result, we were not entirely satisfied, for we had wanted to train the entire group up to perfect discrimination ability. This wish was consistently frustrated.

After the training just described, we attempted to push the subjects' ability to discriminate to a higher level by training them to listen to a French sentence, and to identify which of three given words it contained. For example, the subject hears *Ils vont faire cela,* and must circle *vont, vent,* or *vain.* On this difficult task, the group mean on a recent pilot experiment was roughly 6.5 after some training. Clearly, we had taught them something, for the chance score was 3.33, as against a mean of 6.5 among our subjects. But it seems that one cannot realistically expect to train subjects up to this level of discrimination. For one thing, this is a finer discrimination than is usually required even of native speakers, for our subjects had no help from the context of the sentence. For another, this task may require a degree of motivation which one cannot expect all subjects to possess.

Let's turn now to the other pronunciation problem, that of the good and bad renderings of the sound *o,* as in *chaud.* As was mentioned, the possibility of having the subjects learn to rate goodness of pronunciation was soon abandoned. We decided to train them to discriminate between the pronunciation of native speakers and that of Americans; here the criterion is incontrovertible. To try this out, I recorded a program in which I pronounced words like *chaud . . . saut . . . beau,* first as a Frenchman would, namely with an undiphtongized *o,* then with a diphtongized American *ou.* The original program led by stages from the ability to tell that *sou* was an American, not a French pronunciation, to the ability to make this decision when confronted with the sentence *Il fait show aujourd'hui.* It was found, however, that this amount of training was not needed, as students learned to discriminate almost perfectly after a little training. On one try-out, for example, the mean score of 31 subjects on a pre-test before the training was 22.8 out of 30, with scores ranging from 11 to 29. After a five minute training, their mean score was 29.5, with little variability. The use of my own voice as both Frenchman and American had an interesting effect. To be sure of making a clear distinction, I was careful to pronounce a particularly closed *o* in the French phrase. Many subjects, patterning their own pronunciation after mine, went even further in this direction and, on the post-test, pronounced a clear *u.* This demonstrated that the program had been effective but also revealed the need to substitute other voices, those of native Frenchmen and native Americans, for my voice. To do this, several French persons of both sexes were asked to record their pronunciation of the words *chaud . . . faut . . . beau . . . saut,* while several Americans recorded their pronunciation of the words *show . . . foe . . . bow* (-tie) *. . . sew.* By having an American say *show,* we arrived at a common mispronunciation of the word *chaud,* while retaining the naturalness of a native American saying an English word. The pairs *chaud . . . show, faut . . . foe, beau . . . bow* and *saut . . . sew,* said by a number of male and female voices, constituted the examples of good and bad French pronunciation for our discrimination training.

Time does not permit the description of the laboratory practice and post-test phases of the main experiment. Suffice it to say that the laboratory practice consists of allowing students to record, and listen back to their utterances of the same sorts of words used in the discrimination training and in the post-test, alongside native pronunciation of these utterances. The post-test consists of eliciting student pronunciations of these same words, or words similar to them. By the time of the post-test, all subjects, both control and experimental, are familiar with the simple rules of orthography we have used, and so can be asked to read words aloud. The problem on the post-test is to allow differences in pronunciation between the control and experimental group to be measured.

In order to amplify any differences which may exist, the subjects are required not only to say words one at a time, but also in groups of two or three, for example, *pends . . . vont,* or *font . . . vent . . . main.* The idea behind this is that interference among the words will cause deterioration of pronunciation, but that better trained students will deteriorate less. These are some of the attempts made to overcome our programming problems. The principal conclusion to be drawn from them is that it is not at all clear just what is meant by the word discrimination, as applied to foreign language learning. If it is merely saying "same" or "different" to two stimuli present together, the task is trivial, and most such discrimination can be made without any training. If discrimination means recognizing which of two utterances was said, then must we not allow for the same contextural clues enjoyed by the native speaker in addition to purely acoustic ones? If discrimination also means attaching the appropriate written symbol to a given sound, this runs counter to the current idea of withholding written symbols at beginning stages of language learning. Finally, it is entirely possible that the distinction between discrimination of sounds and production of those sounds may be an artificial one. Watching students move their lips as they attempt to discriminate sounds, one is struck at the close, indeed the inextricably close relationship between listening and speaking. Though we have made and will continue to make some effort to throw light on this subject within the framework of this experiment, what is really needed is a full-fledged investigation of the relationship between discrimination and differentiation, between listening and speaking. The results of such an investigation might have important consequences for foreign language training procedures.